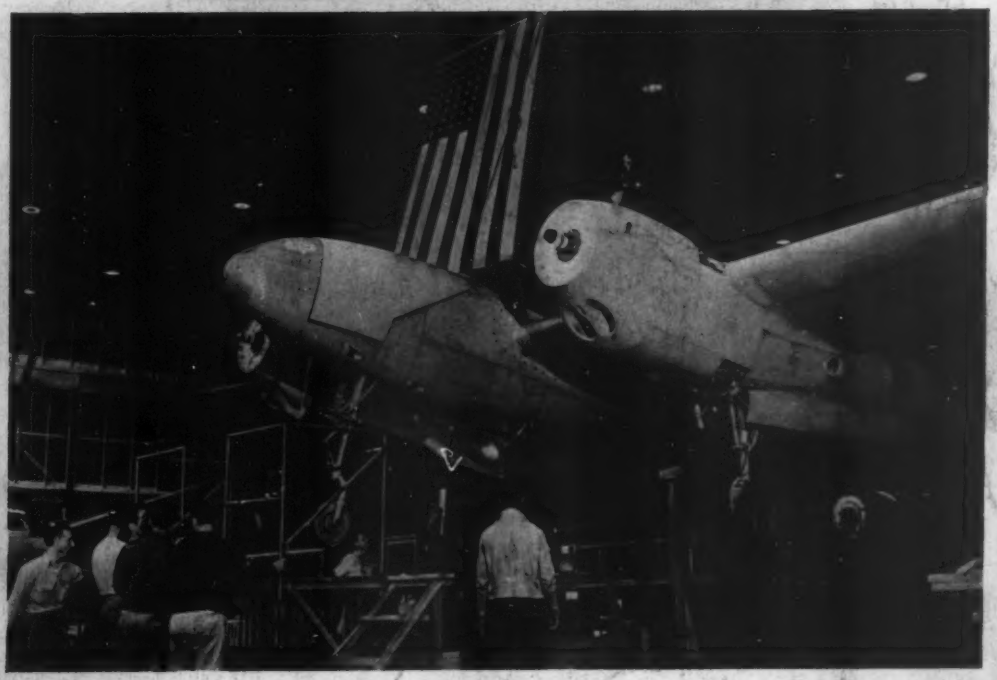
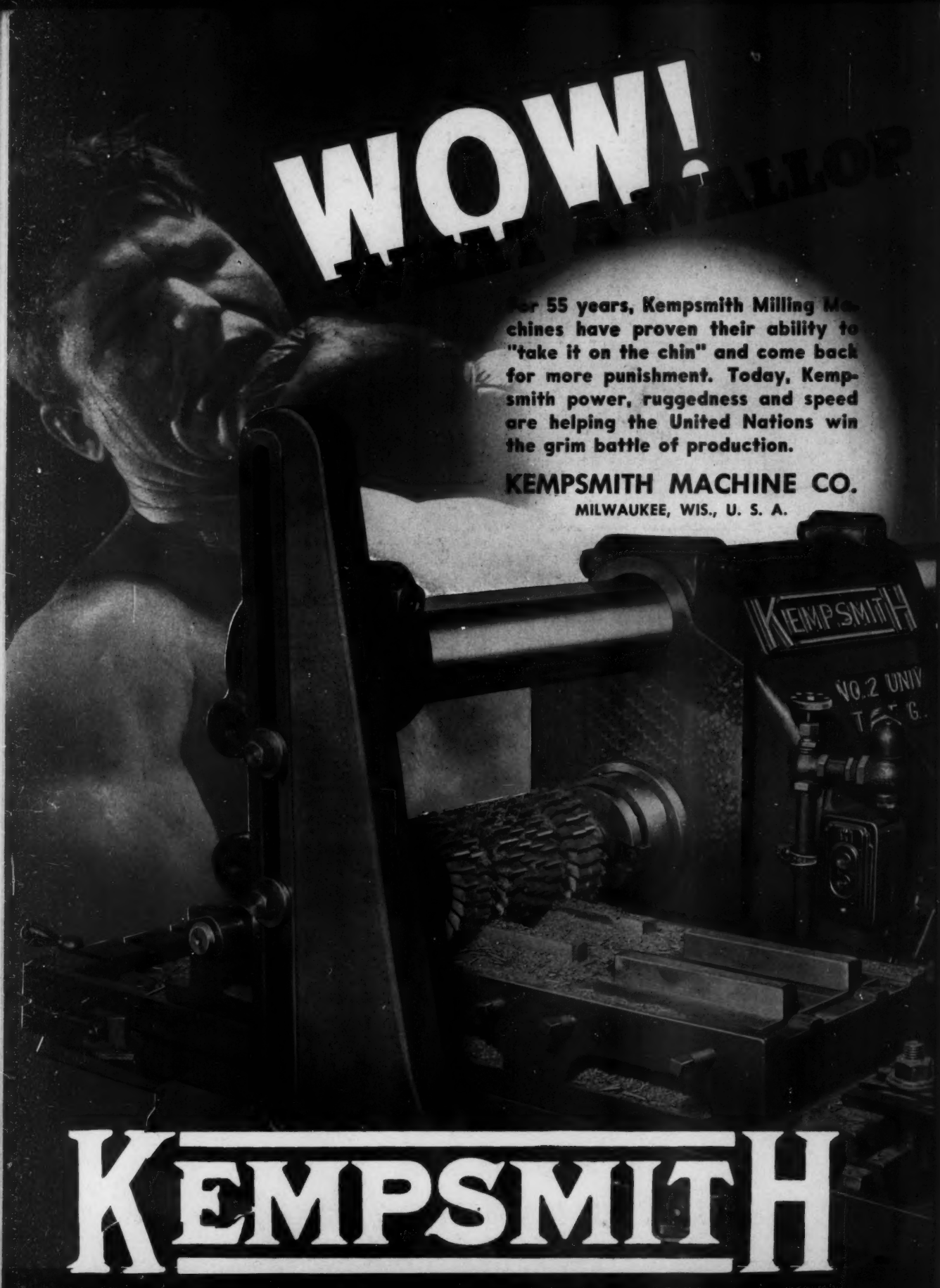
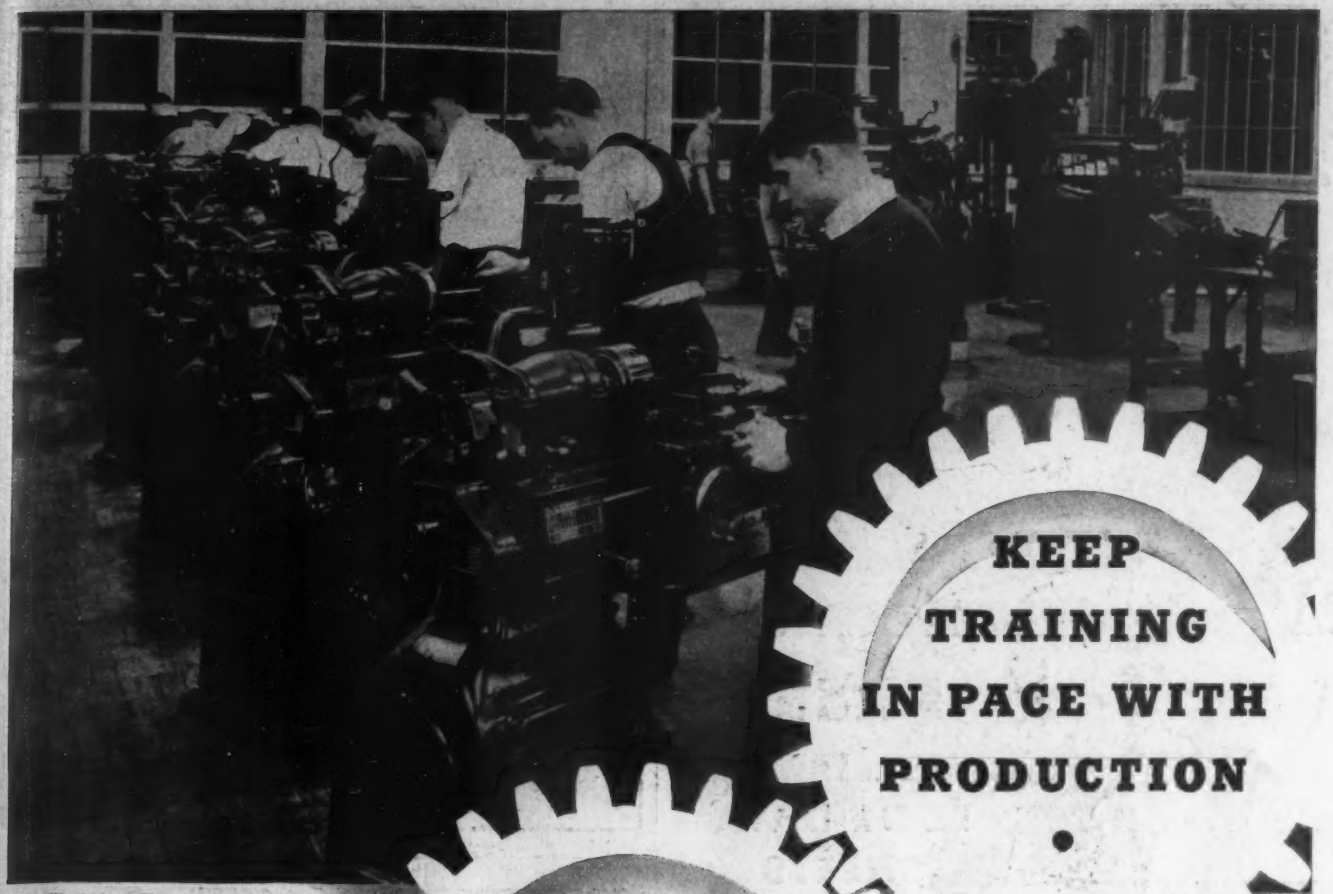
INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

C LIBRARY
AY 21 1943
DETROIT



THE SHOP TEACHERS' PROFESSIONAL MAGAZINE


WOW!
For 55 years, Kempsmith Milling Machines have proven their ability to "take it on the chin" and come back for more punishment. Today, Kempsmith power, ruggedness and speed are helping the United Nations win the grim battle of production.
KEMPSMITH MACHINE CO.
MILWAUKEE, WIS., U. S. A.
KEMPSMITH
KEMPSMITH



Westinghouse Photo

KEEP TRAINING IN PACE WITH PRODUCTION

TO KEEP TRAINING in pace with the constantly accelerating war production program, thousands of men and women must be prepared to take their places in industry in the shortest possible time. One or more new workers are needed for each new machine. And every man called for service with the armed forces must be replaced without delay.

Modern shop equipment is required for practical industrial apprentice-training. South Bend Lathes are widely used in the war industries and are therefore especially desirable for school use. Modern in design, rugged, accurate—they are equally popular in industrial and school shops. Write for our new Catalog 100B which describes South Bend Engine Lathes, Toolroom Lathes and Turret Lathes.

TEACHING HELPS
for Shop Classes

South Bend teaching helps—books, sound films, wall charts and bulletins on the care and operation of lathes—are available for school shop instruction. Write for Bulletin No. 21-C.

SOUTH BEND *Precision* LATHES

SOUTH BEND LATHE WORKS, SOUTH BEND, INDIANA

LATHE BUILDERS FOR 36 YEARS

WANT SOME TIPS ON BORING TOOLS?

FREE!
WILLIAMS' TOOL DATA SHEETS

● If you operate a lathe, you'll want Data Sheet No. 2. It discusses modern tools for boring and internal threading. Other data sheets in this free series (all punched for 3-ring binder) cover the subjects listed below. Circle the numbers on coupon indicating subjects desired and mail today.

1. Characteristics of Williams' "Superior" Wrenches.
2. Data on Williams' Boring Tools.
3. Data on "Vulcan" Chain Pipe Tongs.
4. Data on Williams' "Supersocket" Wrenches.
5. Data on "Vulcan" Lathe Dogs.
6. Data on "Vulcan" Chain Pipe Vises.
7. Data on Williams' Turning-Tools
8. Data on Williams' "Superior" Wrenches.
9. Saving Time with Williams' "Supersockets".
10. Data on "Vulcan" Eye Bolts.
11. Data on Williams' "C" Clamps.
12. Use of Williams' Cutting-off Tool Holders.
13. Use of Williams' Knurling Tool Holders.

MAIL THIS COUPON

J. H. Williams & Co., Dept. I-643, Buffalo, N. Y.

Please send Data Sheets circled below: ☐ for binders ☐ for posters

1 2 3 4 5 6 7 8 9 10 11 12 13

*Name*_____

*Address*_____

*City*_____ *State*_____

Detroit Public Library

WILLIAMS
SUPERIOR DROP-FORGED TOOLS

Machine Shop Teachers Attention

KNOCK-OUT Expanding Mandrels should be employed in your shop to assist in instructing your students. Economical to the extent that they will pay for themselves after being used on two jobs, where solid arbors would otherwise have been made. In sizes to accommodate work ranging from ⅜" to 5-½".

KNOCK-OUT

Write or wire for Bulletin No. M43 IAVE-6

K. O. LEE CO.
Aberdeen, South Dakota

Tannewitz DI-SAWS

are ESSENTIAL to Teaching MODERN Tool & Die Making

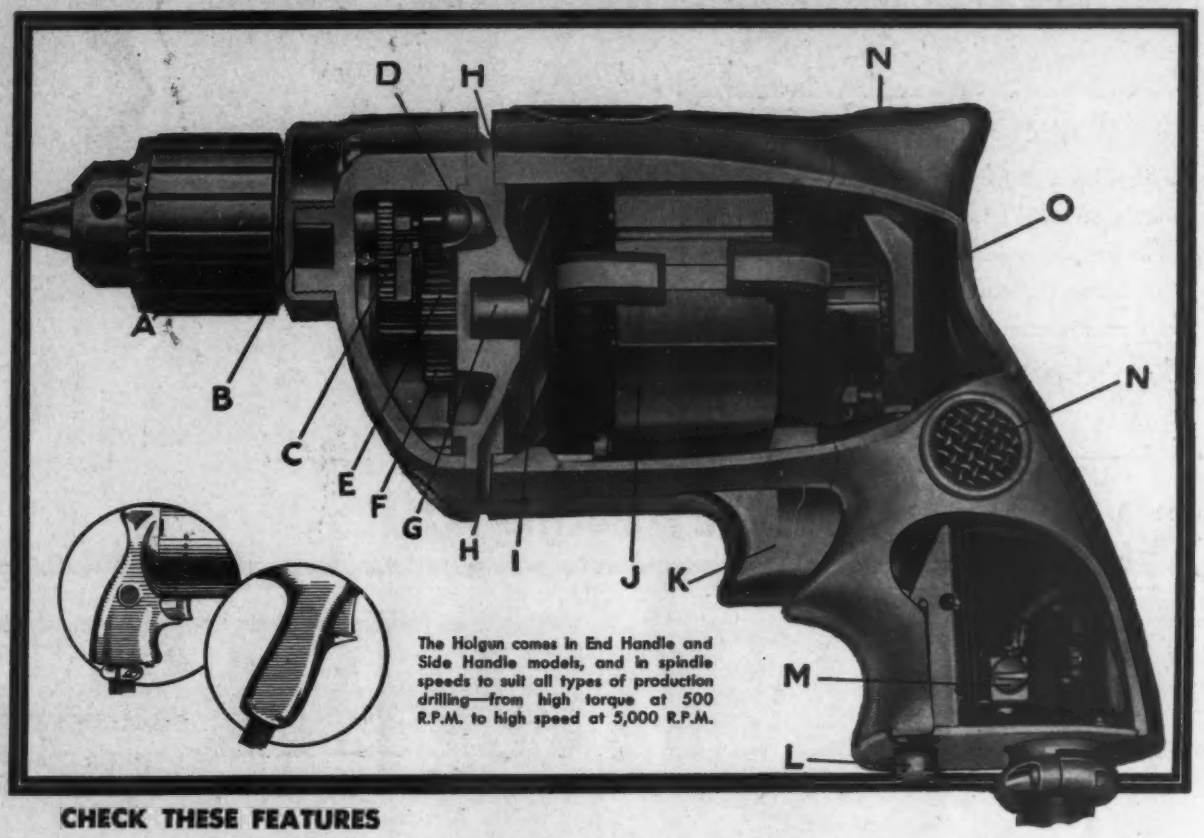
The innumerable and truly amazing time and money-saving shortcuts which may be effected by DI-SAWING is causing this equipment to be almost universally adopted by the leading shops. For inside and outside cutting, filing and polishing the DI-SAW is obsoleting other methods. Put the TANNEWITZ DI-SAW on your MUST list. Complete details of this exellent machine will be sent you promptly on request. Just ask for DI-SAW Bulletin.

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

The INSIDE STORY

of the famous Black & Decker HOLGUN

—most widely used electric tool in war industry!



The Holgun comes in End Handle and Side Handle models, and in spindle speeds to suit all types of production drilling—from high torque at 500 R.P.M. to high speed at 5,000 R.P.M.

CHECK THESE FEATURES

A — Heavy-duty Jacobs 3-jaw geared precision chuck, threaded on spindle.

B — Deep-groove ball-bearing on chuck spindle with inner and outer races locked in place. This feature minimizes wear, insures greater spindle accuracy and eliminates nose-heaviness.

C — Splined mounting of spindle gear increases strength, facilitates inspection, reduces noise, friction and wear. Spindle and gears are of heat-treated alloy steel.

D—Needle roller bearing on back end of spindle.

E—Full size armature pinion, with 12 teeth, insures smooth, noiseless operation, less wear and longer service.

F — Sturdy intermediate gear; ball-bearing mounted inside the gear.

G—Generous size, double grease-sealed ball-bearing on armature shaft.

H—Ample air outlet slots prevent clogging of ventilating system.

I—Full size fan mounted on armature shaft.

J — Powerful Black & Decker Universal Motor; through-bolts hold field securely.

K—Famous "Pistol Grip & Trigger Switch." Instant release switch control convenient for right or left hand use.

L—Switch locking pin for optional use on continuous operation.

M—2-pole automatic release switch. The switch, locking pin, cord protector and 3-wire cable are mounted in handle as one complete unit.

N—Three screened air inlets, any two of which provide ample ventilation.

O—Brush holders and springs mounted on moulded bakelite brush ring, locked in place by switch handle.

THE BLACK & DECKER HOLGUN is practically "standard" in war industry today. Always the leaders in engineering development, Black & Decker engineers offer in America's favorite electric drill a light, compact package of power—with pistol grip and trigger switch—designed for high speed work in close quarters and built to "take it" under extreme operating conditions. The *Handful of Power* HOLGUN is available in spindle speeds for all kinds of drilling that mean greater production, longer service, lower maintenance cost, less operator fatigue (especially among women war workers), less interruption to vital production of planes, tanks, ships, guns and other weapons of war.

Train Better Students . . . .

with war industry's favorite electric tools—whether the job calls for "Handful-of-Power" Holguns or other tools from the complete Black & Decker line. Your students deserve to get the feel of the tools *now* which they'll most likely use when they graduate to industry. Your nearby Black & Decker Distributor will be glad to help you select the tools you need. The Black & Decker Mfg. Co., 780 Pennsylvania Ave., Towson, Md.

LEADING DISTRIBUTORS EVERYWHERE SELL

ARMY E NAVY

Black & Decker

PORTABLE ELECTRIC TOOLS

Make "FANCY" Finish a part of Every Project

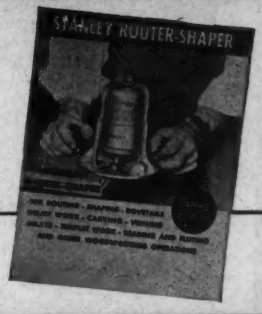
. . .

STANLEY No. 10 ROUTER-SHAPER

3/8 H.P. 18,000 R.P.M.

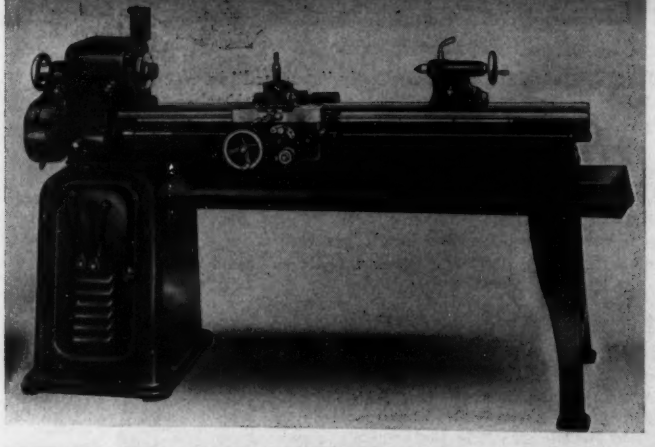
Let your boys put a professional finish on their work with a Stanley No. 10 Router-Shaper and you'll see a 100% response in added interest. Plenty of variety . . . use it for inlaying, veining, carving, dovetailing, rabbetting, and many shaping cuts. Its high speed motor, 18,000 R.P.M., permits smooth, clean cutting, both with and against the grain.

Catalog No. 605 gives the complete story. Be sure to have a copy for reference. Stanley Electric Tool Division, The Stanley Works, 112 Elm St., New Britain, Conn.



1843 STANLEY 1943 **STANLEY *Electric* TOOLS**

SHELDON



SHELDON BBU-1242 WQ PRECISION LATHE

This quality 12 in. ball bearing tool room lathe is built for precision work and will retain its accuracy under long and hard usage. It has extra collet capacity (to 1" round), the finest precision ball or roller bearings obtainable, an improved heavy-duty, double wall apron with power cross feed; full quick change gears and full bowl headstock. Its improved Sheldon 4-speed, V-belt, lever-clutch operated, underneath motor drive is entirely enclosed in the pedestal leg and has anti-friction bearings. It is so designed that spindle belts operate thru a *standard* 1-piece bed. This bed is bridge-braced with heavy cross girts and has hand scraped ways—2 V-ways and 2 flat ways.

If interested in 10", 11" and 12" quality lathes be sure to see the SHELDON.

SHELDON MACHINE COMPANY, INC.

4244 N. Knox Avenue CHICAGO, U. S. A.

ARMSTRONG

TURRET LATHE AND SCREW MACHINE TOOLS

Today, America Needs TURRET LATHE and SCREW MACHINE OPERATORS

The transition from tooling-up to all-out production has increased the need for turret lathe and screw machine operators. When preparing your courses to help fill this need it would be well to build them around ARMSTRONG TURRET LATHE and SCREW MACHINE TOOLS. These are provided for the basic operations, and take standard drills and knurls or cutters that anyone can quickly grind from stock shapes of high speed steel. Permanent, multi-purpose tools, they reduce tooling-up to the selection of cutters, adjustment for clearance and tightening of set screws.

Write for catalog C-39a

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People" 322 N. Francisco Ave., Chicago, U. S. A.

Eastern Warehouse & Sales: 199 Lafayette St., New York

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, June, 1943, Volume 32, No. 6. Published monthly, except during July and August, by The Bruce Publishing Co., Milwaukee, Wis. Entered January 2, 1914, as Second-Class matter at Milwaukee, Wis., under Act of March 3, 1879. Subscriptions — U. S., $2.50 per year. Canada and Foreign, $3.00. Single copies, 35 cents.

UNBELIEVABLE ACCURACY IN FIRING CERAMICS!

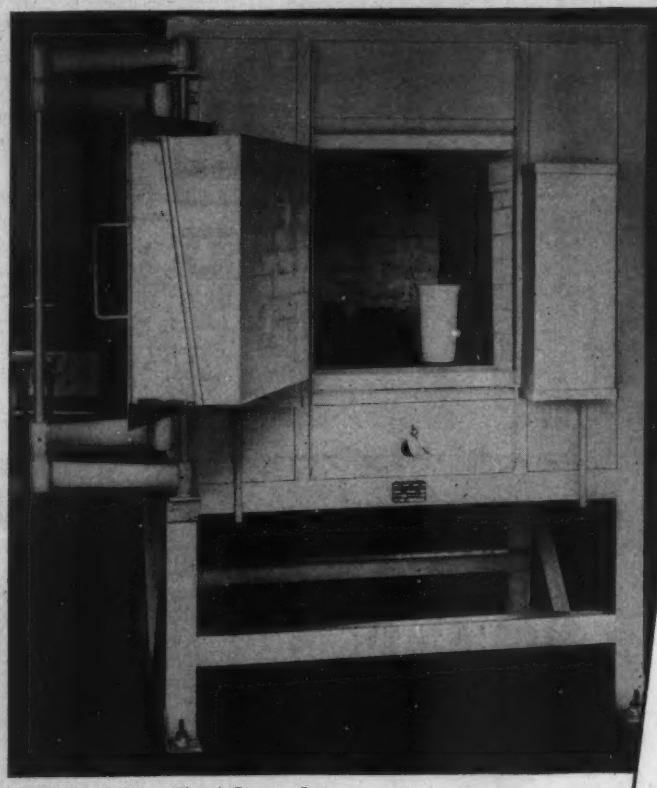


Photo Courtesy Harper Electric Furnace Corp.

AT EXCEPTIONALLY LOW COST WITH THIS HIGH TEMPERATURE ELECTRIC KILN EQUIPPED WITH GLOBAR BRAND HEATING ELEMENTS

Specifications:

FURNACE:

1. Batch type, periodic.
2. Loading space: width 20", height 25", depth 21";
3. Temperature, up to 2500°F.
4. Normal rating, 20 kw.
5. Air dampers at front and rear for regulating air circulation through the furnace.
6. Removable floor tile and side wall baffles.
7. Plug type door, mounted on articulated double hinges.
8. Weight 2300 lb.

Note: Smaller Furnaces also available.

ELECTRICAL EQUIPMENT:

1. Automatic pyrometer with 24-hour program controller.
2. Automatic time switch.
3. Scott connected insulated transformer with 17-point selector switch, regulating both secondary phases simultaneously and automatic cutout to prevent switching under load.
4. Primary ammeter for indicating the furnace load in amperes.

• Kilns like these are setting new high standards for accuracy in firing ceramics.

And when we say "accuracy", we mean accuracy in *controlling* temperatures, accuracy in temperature *distribution* and accuracy in reproducing any given furnace condition.

The kiln shown above can be controlled within 4°F. throughout the loading space. But that's only half the story. Operating costs are 40¢ an hour with energy costing 2¢ per kw. hr.!

And here are other important considerations:

1. Low over-all costs of production.
2. High quality of final product.
3. Reduced number of rejects, which influence productive capacity as well as manufacturing costs.
4. Dependability and continuity of operation of your equipment.

These points can all be demonstrated. You can evaluate them for yourself, with a "Globar"-equipped High Temperature Electric Kiln.

GLOBAR DIVISION

THE CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.

REG. U. S. PAT. OFF.

MANUFACTURERS OF GRINDING WHEELS, COATED ABRASIVES, SUPER REFRACTORIES, HEATING ELEMENTS

(Carborundum and Globar are registered trade-marks of and indicate manufacture by The Carborundum Company)

Atlas

F-SERIES 10"

LATHES

The lathe is the basic tool in modern shops . . . and Atlas is the lathe for basic training! Precision-ground bed, V-belt drive, automatic power cross feed. Available with Timken bearings for high speed work and turret attachments for screw machine operations. Give more students the "feel" of production with low-cost Atlas lathes.

ATLAS PRESS COMPANY
671 N. Pitcher St., Kalamazoo, Mich.

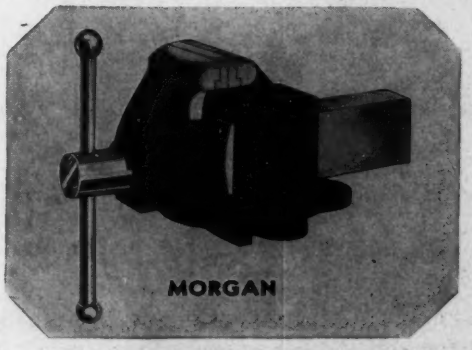
LATHES · DRILL PRESSES · ARBOR PRESSES · SHAPERS · MILLING MACHINES

YOU ARE PRACTICING WAR TIME

ECONOMY

WHEN YOU STANDARDIZE ON

MORGAN VISES



MACHINIST VISE

Unsurpased for strength and durability. Supplied with stationary or swivel base and in various sizes.

MORGAN VISE CO.
120 N. Jefferson Street Chicago, Illinois

WEIDENHOFF

Automotive - Aviation

SERVICE EQUIPMENT

A Practical Book For Pre-Induction Training Courses

Here is a practical treatise dealing with the fundamentals of automotive electricity and allied units, the maintenance of which is vital to good engine performance. The text has been kept simple and many illustrations and diagrams are used.

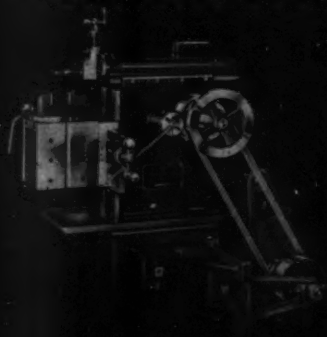
Subjects covered include automotive electric systems, magnetism and electricity, the ignition system and the high-tension magneto.

Sent free of charge to instructors requesting it on their letterhead. A liberal discount for distribution to students when ordered in quantities of 10 or more.

JOSEPH WEIDENHOFF, INC.
CHICAGO, ILL.

RHODES

7" HORIZONTAL SHAPER
3½" VERTICAL SLOTTER



Convertible

TO A SHAPER OR SLOTTER IN 15 MINUTES!

RHODES MFG. CO., Waltham, Mass.

YOU DON'T HAVE TO STAND AT THE STUDENT'S ELBOW *with* walker-Turner MACHINE TOOLS

Less time needed for individual instruction, more time available for group project training — that's the story in every vocational school equipped with Walker-Turner Machine Tools. With today's crowded classes and stepped-up schedules, it's a mighty important consideration.

Here's how Walker-Turner Machine Tools help the vocational instructor:

❶ Simplified design makes Walker-Turner Machine Tools easier for the student to understand and operate. He can concentrate on the project rather than on the machine.

❷ Avoidance of elaborate controls and involved mechanism makes them safer. The student is not "afraid" of his machine.

❸ Rugged construction eliminates repeated breakdowns that destroy the student's confidence.

Thoroughly job-tested in hundreds of war industries, Walker-Turner Machine Tools are priced to fit your school budget and are promptly available for war training. Send for new catalog.

WALKER-TURNER COMPANY, INC.
1963 Berckman Street **Plainfield, N. J.**

walker-Turner COMPANY, INC. PLAINFIELD, N.J. U.S.A.

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

SHELDON

VOCATIONAL TRAINING

No. 100-24-DS
Open Frame Shop Bench

BENCHES

Our men in the front lines have the finest fighting equipment. The men behind the men at the front, those in industry engaged in the war effort, must also have the finest equipment. Sheldon vocational tables and shop benches, proved by over 40 years of experience, are the very finest obtainable. They are being used in civil and armed force training schools throughout the country.

Write today for our shop bench catalog.

SHELDON ALSO MANUFACTURES A COMPLETE LINE OF SCIENCE LABORATORY, HOME ECONOMICS, AND ART FURNITURE.

E. H. SHELDON & COMPANY
723 NIMS ST. MUSKEGON, MICHIGAN

"OLIVER"
HAND PLANER and JOINTER

The Oliver No. 144 is a most efficient planer and jointer, for practical school shop use. Made of the best of materials and workmanship it will give many years of real service. Fully guarded.

Direct motor drive — saftey inserted knife type cutterhead equipped with three high speed knives—adjustable bevel fence — rabbeting arm — and wrenches.

The "OLIVER" LINE also includes

Saw Benches
Oilstone Tool Grinders
Jig Saws
Speed Lathes
Jointers
Surfacers
Vises
Shapers
Sanders
Boring Machines
Band Saws
Wood Trimmers

Interesting descriptive literature on any machine you are interested in, will be promptly sent upon request.

OLIVER MACHINERY COMPANY
GRAND RAPIDS MICHIGAN

Practical Textbooks
Examine Them on APPROVAL

These modern texts have been especially prepared for school use. You can employ them to excellent advantage in your War Training program as well as your regular program. An examination will convince you of their suitability to your classroom needs. Any books sent for 30 days ON APPROVAL inspection subject to our educational discount if retained.

Fundamentals of Electricity and Wookbook (PIT)	$2.50
Fundamentals of Machines and Workbook (PIT)	2.50
Fundamental Shop Training and Workbook (PIT)	2.50
Dunwoody Arc Welding Unit	1.25
Dunwoody Gas Welding Unit	1.25
Aerial Navigation	0.75
Mechanical Drawing	2.00
How To Remodel A House	4.75
Plane Trigonometry Made Plain	2.75
Metallurgy	2.50
Shipbuilding Blueprint Reading	3.00
Tool Design	4.50
Machine Trades Blueprint Reading	2.00
Plastics	3.00
Electrical and Radio Dictionary	1.00
How To Read Electrical Blueprints	3.00
*Flight—First Principles	2.50
*Flight—Aviation Engines	3.25
*Flight—Meteorology and Aircraft Instruments	3.25
*Flight—Construction and Repair	2.50
Machine Shop Work	3.50

*Note: These books have been listed in Leaflet No. 63 issued by U. S. Office of Education

(TEAR OFF HERE AND MAIL TO US)

AMERICAN TECHNICAL SOCIETY
Drexel Ave., at 58th St., Chicago, Dept. HS 163

Please send the following texts for 30 days ON APPROVAL examination. I will either return them at the end of that time or remit less your educational discount.

Name _____

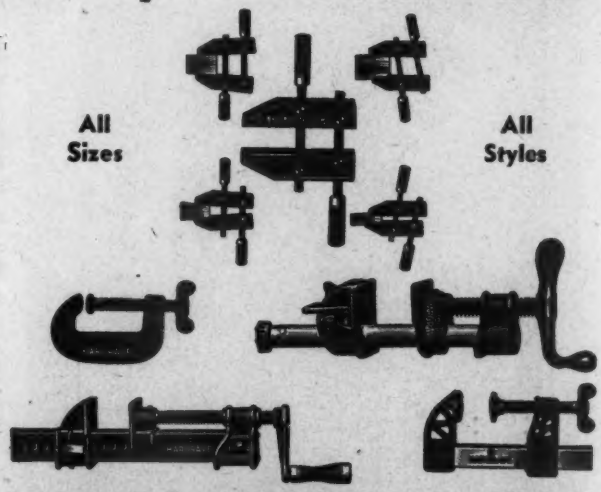
School _____

School Address _____

It Pays to Use the Best

All Sizes

All Styles



Designed and built to stand the hard every day grind of production work and improved from time to time, with the assistance of some of the largest industrial users. HARGRAVE TESTED CLAMPS have been the leaders in this field since 1879. They cost no more than ordinary clamps.

ASK YOUR SUPPLY HOUSE

CATALOG showing our complete line of Clamps, Chisels, Punches, Bench Anvils, Saw Vises and other tools for the SCHOOL SHOP will be mailed to you upon request.

THE CINCINNATI TOOL CO.
Waverly and Main Aves. Cincinnati, Ohio

MEN TRAINED WITH
SKILSAW TOOLS
ARE PREFERRED in INDUSTRY
...because industry prefers
SKILSAW TOOLS!
SKILSAW DISC SANDERS—Speed up all grinding, filing, sanding and polishing on flat or curved surfaces of all materials. 6 MODELS.
SKILSAW DRILLS—Light, compact, powerful for faster, better drilling on every job from lightest lead holes to heaviest reaming. 23 MODELS.
SKILSAW BELT SANDERS—For all "final-finishing" on flat surfaces of wood, metals, compositions. Belt widths: 2½, 3 and 4½ inches. 4 MODELS.
SKILSAW PORTABLE ELECTRIC TOOLS
★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

It's just good sense to train new workers with SKILSAW TOOLS . . . the tools they'll find preferred in aircraft, tank and war plants everywhere! That way your students will make the shift to real production *easier* . . . reach peak output *quicker*. And they will learn faster . . . do perfect work sooner with these tools that are proved in industry itself.

SKILSAW TOOLS are lighter, more compact, more powerful. They're perfectly balanced for easier handling, easier learning. Ask your dealer to demonstrate SKILSAW TOOLS *today!*

SEND FOR THIS FREE CATALOG! It illustrates every tool in the SKILSAW line. Then ask your dealer to demonstrate them on the jobs you teach.

SKILSAW, INC., 5035A Elston Ave., Chicago, Ill.

New York • Boston • Buffalo • Philadelphia • Cleveland • Detroit
Indianapolis • St. Louis • Kansas City • Atlanta • New Orleans
Dallas • Los Angeles • Oakland • Portland • Seattle • Toronto, Canada

"Jorgensen" TRADE MARK REG U S PAT OFF

stands for highest quality

CLAMPS

It is not enough merely to specify "JORGENSEN" when ordering. You should look for the "JORGENSEN" Trade-mark on the handscrews which you receive to avoid future disappointment. Genuine "JORGENSEN" handscrews have clear, strong well-seasoned jaws, with handles that do not loosen, with long-wearing threads, and nuts that do not break. They will stand "schoolboy" service. Look for the "JORGENSEN" trade-mark.

Genuine "PONY" Clamps are designed, manufactured and guaranteed by us also. Style No. 50 "PONY" Clamp Fixtures are recommended for schools because they attach to ordinary ¾" pipe to make clamps of any desired length, providing low-cost, light, strong clamps for work of any size. Equipped with the finest and exclusive "Multiple Disc Clutch" holding device, which "zips" to position and stays put any place.

Write for No. 16 General Clamp Catalog

ADJUSTABLE CLAMP CO.

"The Clamp Folks"

424 N. Ashland Ave., CHICAGO

METAL DUPLICATING *Without Dies*

DI-ARCO Precision Machines—Shears, Brakes, Benders—have made possible a method of "DIE-LESS DUPLICATING" that practically amounts to a new production technique for making a great variety of small parts and pieces. Leading schools and universities are equipped with these bench machines and thousands are in use by War industries, saving Man Hours and Critical Materials. Their ease of operation makes them ideal for use by girls. Investigate their possibilities for your training courses.

In illustration from left to right: 1st — Di-Arco Shear squares and sizes material, cuts strips, makes splits or notches. 2nd — Di-Acro Brake forms angles, channels or "Vees." 3rd — Di-Acro Bender bends angle, channel, rod, tubing, wire, moulding, strip stock, etc. All duplicated work is accurate to .001".

WRITE FOR CATALOG

"Metal Duplicating Without Dies" describing Di-Acro Shears, Brakes and Benders and showing many parts which can be made.

O'NEIL-IRWIN MFG. CO.

351 8th Ave. S., Minneapolis, Minn.

LUFKIN STEEL RULES

• TEMPERED STEEL

MOST SATISFACTORY RULES FOR SCHOOL SHOP USE

LUFKIN

PRECISION TOOLS • TAPES • RULES

SAGINAW, MICHIGAN NEW YORK CITY

BURRILL'S

Paramount Band Saws

Your students should be provided with *BAND SAW BLADES* which have been adopted as being able to stand the stiff requirements of War Production Plants.

Accurately made Band Saws of extreme toughness enables more work to be produced in less man hours.

All sizes are carried in stock for prompt shipment.

Exclusive Band Saw Manufacturers.

PARAMOUNT SWEDISH BANDS

ACCURATELY SPACED TEETH

NO CRUSHED POINTS - GUARANTEED

BURRILL SAW & TOOL WORKS

ILION, N. Y.

ATKINS *Silver Steel* SAWS

PROVIDE

Realistic Training

FOR THE HOME FRONT ARMY

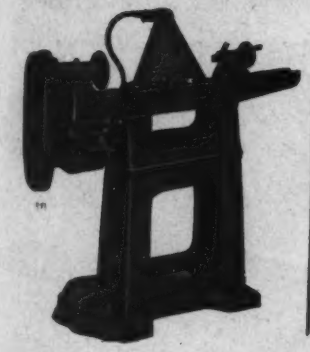
Like military instructors, manual training teachers find there is no substitute for training men under what approximates actual battle conditions. That's why many of the Nation's largest schools use Atkins Silver Steel Saws to teach the correct fundamentals. These are the same saws that graduates will find in wide use throughout industry—saws with outstanding qualities of endurance, saws correctly designed to cut easy and smooth, saws of every type for any cutting job.

Get Atkins New Wall Chart on Saw Fitting . . . It's Free

This new teaching aid shows the proper methods of filing and setting saws. On heavy paper, suitable for wall mounting. Write for a copy today.

E. C. ATKINS and COMPANY • 404 S. Illinois St., Indianapolis, Ind.

WALLACE
"MACHINE-OF-THE-MONTH"



No. 46 LATHE

Nine variable speeds from 550 to 2400 r.p.m. Automatic-tensioning belt drive. Hardened steel spindle with taper-roller bearings for end thrust. Swiveling headstock for face plate work to 30" diameter.

Here is a lathe equipment of which you can be proud! Sturdy design, precision machining, insures accurate and trouble-free operation. The variable speed drive and heavy-duty headstock invite its use for metal-spinning as well as wood turning.

Swivelling headstock gives unlimited capacity for face plate and center turning work.

Write today for bulletins and prices — we also manufacture quality Universal Saws, Cut-off Saws, Bandsaws, Jointers, Mortisers, Shapers, Oilstone Grinders, etc.

J. D. WALLACE & COMPANY

140 S. CALIFORNIA AVE. CHICAGO, ILL.

No Bit Escapes This HICKORY TEST Board

This is one of the many hundreds of tough hickory slabs used to give Russell Jennings Auger Bits actual boring tests before shipping. No mercy is shown in this test—no bit escapes it! That's why Russell Jennings quality is so uniform.

Only tool steel is used that will take a long-service edge. The screws are accurately centered. The hole sizes are always correct. But then — these bits are the result of nearly 90 years of experience!

Russell Jennings AUGER BITS

THE RUSSELL JENNINGS MFG. CO., CHESTER, CONN.

TRAIN YOUR STUDENTS
with Campbell Finishing Products!

For Directors, Supervisors and Shop Instructors, the M. L. Campbell Company offers special products to help streamline and speed-up Shop work to meet present war-industry needs. You'll find it pays to "Call on Campbell."

Some of Campbell's Shop Aids:

Dry Stains
Water Soluble
Spirit Soluble
Oil and Lacquer Soluble
Stick Shellac
Quick Drying Varnishes
Nitro Cellulose Lacquers
Ethyl Cellulose Lacquers
Enamels
Fillers
Sealers
Bleaches
Removers
Thinners
Shellac Enamels

SOMETHING NEW
MAGIC SANDPAPER CLEANER—Cleans wood fibers, resins, pitch, etc. from abrasive belts, discs, cloth or paper, like new.
DOUBLE LIFE OF ABRASIVE! Try 5 gallon sample order, special $9.50 frt. prepaid. Order Now!

FREE Get Your Copy of Campbell's Descriptive Price List describing dozens of other products and authentic techniques of wood finishing.

YOU CAN COUNT ON CAMPBELL

M. L. CAMPBELL Company

"Fine Finish Leadership for 25 Years"

704 E. 19th St. KANSAS CITY, MO.

Insignificant?

NOT AT ALL...IT'S THE....

*"Carrier of news and knowledge. Instrument of trade and industry. Promoter of mutual acquaintance. Messenger of sympathy and love. Servant of parted friends. Consoler of the lonely. Bond of the scattered family. Enlarger of the common life."**

Yes — the envelope . . . whatever its purpose and to whomever it goes . . . has an important mission as your personal representative. Make sure it has quality and distinction.

Ask Western for helpful information.

*Inscription on new Post Office Bldg. in Washington, D. C.

WESTERN STATES ENVELOPE CO.

1616 W. Pierce Street - Milwaukee, Wisconsin

RUBYFLUID

Helps You Teach Good Soldering Practices

It's easier to teach good soldering and tinning with *Quality* soldering fluxes. That's why so many instructors have turned to Rubyfluid.

Rubyfluid is available in flux or paste form. It wets out freely and properly conditions the metal so that a neat, strong soldered union is possible without fuss or bother. Rubyfluid is pleasant to use — there are no objectionable or dangerous fumes.

For Stainless steel use RUBY'S Stainless Steel Flux. It eliminates many of the problems that formerly arose from attempts to join that metal. No special equipment or excessive heat required, thereby eliminating discoloration. Used and recommended by stainless steel fabricators.

Allow your students to enjoy the advantages these quality soldering products offer. Order from your supplier or direct from —

RUBY CHEMICAL CO.
77 McDowell St. Columbus, Ohio

Rubyfluid

NOW is the time to select

Shop Training Projects for Fall!

PLAN RIGHT NOW to place Lewis Projects at the top of your list for machine shop training projects this fall. Here's why:

COMPLETE PROJECTS — Plain or semi-finished castings plus materials and blueprints furnished for constructing Shapers, Mills, Drill Presses, Vises and other metal and wood-working tools.

GREATER STUDENT INTEREST — Students themselves complete the work, assemble the tool, then operate it . . . receiving valuable training in machine design, construction and operation.

REAL MACHINE TOOLS—Lewis Tools are widely used in war plants, are modern in design, sturdily built, accurate in operation.

LOWER PROJECT COST—Lewis Projects cost about 1/5 that of comparable finished tools, yet become valuable additions to present school shop equipment.

Write for Catalog describing 23 Lewis Projects—and ask for quotations!

Lewis MACHINE TOOL CO.

P. O. Box 116, Station A, Dept. X-28, Los Angeles, California

Now Ready,
FOR YOUR
Pre-Induction Course in
FUNDAMENTALS OF SHOPWORK

Jones and Axelrod's

INTRODUCTORY SHOPWORK

Especially designed for the Pre-Induction Course in Fundamentals of Shopwork recommended by the War Department and the U. S. Office of Education, this book fully covers the topics suggested. Includes use and care of tools, measuring and gaging, woodworking and metalworking, wiring, wire-splicing, and ropework, splices and knots. Carefully explains every step of shopwork, from correct ways of handling and using tools, to efficient methods of doing jobs. Illustrations show how to carry out jobs in the most efficient way. *$2.00.*

Send for a copy on approval.

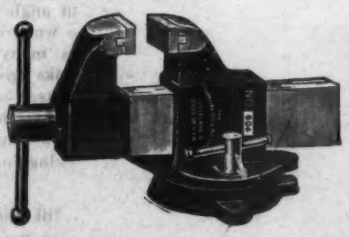
McGRAW-HILL BOOK COMPANY, INC.
330 West 42nd Street New York

COLUMBIAN VISES

INDUSTRY'S FIRST CHOICE FOR OVER THIRTY YEARS

The complete line of Columbian Vises is designed to excel in its field — all are made to the same high standard of engineering and workmanship. A vise for every need and purpose.

Columbian Continuous screw Woodworker's vises are furnished with hard wood handles — or may be equipped with ADJUSTABLE STEEL HANDLES, as above, to eliminate handle breakage, speed operation and provide extra leverage.



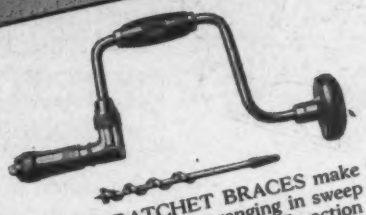
Columbian Machinist's Vises are made of malleable iron castings, guaranteed unbreakable, and designed to provide accurate, dependable equipment for school and industrial shops. All standard types.

ARMY E NAVY

Army-Navy "E" Award for Excellence awarded April 8, 1943

THE COLUMBIAN VISE & MFG. CO.
9022 BESSEMER AVENUE CLEVELAND, OHIO
THE WORLD'S LARGEST MAKERS OF VISES

KNOW YOUR TOOLS
by MILLERS FALLS



THIRTY-ONE RATCHET BRACES make up the standard Millers Falls line, ranging in sweep from 6 to 14 inches (sweep: radius of handle action . . . the more sweep, the more leverage), in finishes from simple polish to chromium plate, in bearings from simple ball to oil-impregnated. Each fills its special need, each is a Millers Falls *quality* tool, designed and produced with the benefit of all we've learned in 75 years of fine tool making.

AN AMAZING BLADE for hand hack sawing is Tuf-Flex, which Millers Falls unconditionally guarantees as the *most economical* general purpose blade ever developed. Super-tough, super-flexible, it withstands severe side strains, takes a 270° bend without breaking, cuts thinnest sheets and hardest drill rod with equal ease. Eleven sizes cover every hand sawing need. Characteristic Millers Falls quality.

AMONG THE 14 high-production portable electric screw drivers and nut runners in the present Millers Falls line is "Dyno-Mite," a wonderfully light and powerful tool with the famous "Adjusto-matic" clutch, which disengages when pre-selected screw or nut tension is reached. Easily controlled with one hand in awkward corners; smooth, near-vibrationless, trouble-free. Available with 90° or 25° angle drives; stand converts "Dyno-Mite" into convenient bench unit for high-speed assembly.

MILLERS FALLS TOOLS
SINCE 1868
MILLERS FALLS COMPANY Greenfield, Mass., U. S. A.

LESSON No. 3...

ON SPECIAL FILES FOR SPECIAL PURPOSES

ONE of the corner-stones of sound vocational instruction is teaching the value, not only of good tools but of *right* tools. The tremendous pressure on our war industries is demanding many short cuts, calling for the use of new materials, widening the use of older ones . . . creating so many new factors and methods of production that new tool types are constantly needed. The school which keeps closely abreast of such developments gains reputation for itself through the more up-to-date and efficient training of the graduates it sends out.

Nicholson is continually designing and improving special files for special purposes, materials and results. (A rasp for magnesium is one of the most recent.) The 48-page Nicholson book, "File Filosophy"—which we hope you have—tells about the more important ones. The "lesson" below is on the Nicholson File for Brass.

Contact the mill-supply houses for Nicholson or Black Diamond Special Purpose Files. They also carry many of the regular Nicholson kinds. So do good hardware stores.

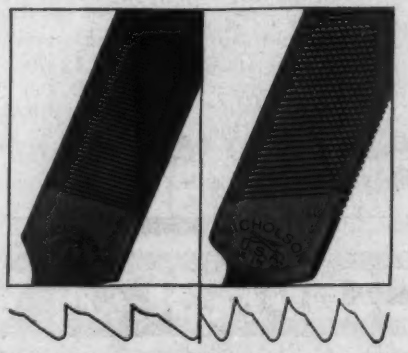
NICHOLSON FILE CO. • 47 Acorn Street, Providence, R. I., U. S. A.
(Also Canadian Plant, Port Hope, Ontario)

THE FILE FOR BRASS

Prepared by
RESEARCH DEPARTMENT • NICHOLSON FILE CO.

WHY BRASS REQUIRES A SPECIAL FILE. Filing brass is far different from filing steel. Though much the softer metal, it is more malleable than steel and also very ductile and tough. A regular purpose file will cut into the brass rapidly enough for a few strokes; but the teeth tend to clog up rapidly and soon begin to slide over the surface of the metal without removing much stock.

File for Brass *Ordinary Flat File*



NOTE COMPARATIVE TOOTH DESIGN *(enlarged)*

THE DIFFERENCE BETWEEN BRASS AND REGULAR FILES. For brass, Nicholson has produced a file with a combination of tooth angles and a number of tooth points per inch that assures excellent results. Compare it with a regular Flat Bastard file. Note that the Brass File has a long overcut angle and a short upcut angle. The short upcut angle prevents the file from running off the work while the long overcut, which produces many fine scallops on the short upcut, breaks up the filings and permits the file to clear itself of chips. This combination of angles and teeth prevents the file from taking too large a bite out of the soft metal and eliminates clogging and chattering.

CORRECT USE OF THE BRASS FILE. Correct use requires the filer to use a little more pressure on the heel than on the point. And a slight motion to the right and left on alternate push strokes contributes to better filing and a smooth finish. Shapes available are Flat and Half Round; sizes, 6", 8", 10" and 12".

NICHOLSON FILES *FOR EVERY PURPOSE*

NICHOLSON U.S.A. MADE IN U. S. A.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

Vol. 32 JUNE, 1943 Number 6

To Our Readers

Although vacations during the duration will not be what they were before the Pearl Harbor episode, INDUSTRIAL ARTS AND VOCATIONAL EDUCATION extends its best wishes to all of its readers at this time. May the summer activities, no matter what they are, redound to the best interests of each and every shop teacher.

Important— Changes of Address

This year your cooperation is expressly solicited to insure delivery of your INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine in the fall and avoid unusual wartime delays. Since the July and August issues are not published, your next copy will be the September issue to appear about August 15. If you plan to be away for the summer and will have a different address on August 15 with a subsequent change after school opening, please let us know *now*. A postal containing the following information, and mailed to us promptly, is all that is required.

Gentlemen: My fall copies of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION should be sent to address below:

August 15 (September issue) to: .....

.....

September 15 (Permanent address) to: .....

.....

(Signed) .....

Present mailing address .....

Detroit Public Library

This Month's Cover

The cut for the cover picture was made from a U. S. government photograph made for the Office of War Information. It shows a pursuit plane, minus its propellers, as it is hoisted from the station stand in the assembly line, prior to being rolled to the testing field.

Photograph, courtesy of Office of War Information.

CONTENTS

The Skilled Mechanic and Modern Industrial Trends, *Arthur B. Mays* 223
Making a Glider Pilot, *O. A. Hankammer* 225
A Commencement Address — "Now, What Is There to Do?" *Clement J. Freund* 226
R Is for Rithmetic, *H. Ernest Conklin* 228
What Is Related Work? *Henry McLain* 230
A Vocational Approach to Education for Distributive Occupations, *Murray Banks* 231
Why I'm Buying a Bond, *Adam N. Reiter* 232
Editorials 233
Annual Boat Regatta, *O. B. Badger* 234
A Lesson Plan, *Lt. Comdr. Edward B. Flaherty* 235
Educational Values and Social Habits Obtained From High School Mechanical Drawing, *B. Alfred Cox* 237
Ship-Fitter Course Trains Workers for the Shipbuilding Industry, *Laurence W. Ross* 239
An Experiment in Summer Employment for Industrial-Arts Teachers, *F. C. Finsterbach* 242
Teacher Personnel Shortages in Industrial Arts, *Harold J. Bowers* 243
Teaching Materials for Industrial Education, *Chris H. Groneman* 244

Problems and Projects

Victory Garden Tools, *N. H. Poole* 247
World War Tank, *James McGregor* 248
By-Products of Teacher-Built Projects, *Harry Pederson* and *Homer C. Rose* 249
Bushel Crate and Crate Assembling Stand, *Louis M. Roehl* 251
Poultry Shelters, *Louis M. Roehl* 253
Developed Length Formula, *K. H. Czirr* 254
Whittling-Jackknife Technique, *W. Ben. Hunt* 255
The Why of War-Plant Shutdowns 256
Saving Valuable Alloys 256
Help Wanted 257
If You Have Arc Welding in Your School 257
Techniques in Using the Band Saw, *John McInnes* 257
Teaching Aids in the General Shop, *Orlando B. Little* 258
Soldering Aids, *Isadore M. Fenn* 260
Design for the Teacher of Industrial Arts, *Burl N. Osburn* 261
Camouflage Course, *Richard E. Bailey* 263

Association News 18A
Personal News 20A
Answers to Questions 23A
News Notes 24A
Shop Equipment News 26A
New Publications 28A

Articles Indexed. — The articles contained in the Magazine are regularly indexed in "The Readers' Guide to Periodical Literature," and "Education Index."

Entered January 2, 1914, as Second-Class Mail Matter at Milwaukee, Wis., under Act of March 3, 1879. Copyright 1942, by The Bruce Publishing Co. Title registered as Trade Mark in U. S. Patent Office. November 25, 1930. Published monthly except during July and August.

Subscription Information. — Subscription price, $2.50 per year, payable in advance. Canadian postage, 50 cents; Foreign Countries, 50 cents. Copies not over three months old, 35 cents; more than three months, 50 cents. Notice for discontinuance of subscriptions must reach Publication Office in Milwaukee at least fifteen days before date of expiration. Changes of address should invariably include old as well as new address. Complaint of nonreceipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.

Editorial Contributions. — The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

PUBLISHED MONTHLY, EXCEPT DURING JULY AND AUGUST, BY THE BRUCE PUBLISHING COMPANY, 540 N. MILWAUKEE STREET, MILWAUKEE, WISCONSIN

Eastern Office: 330 W. 42nd. St., New York, N. Y. — Western Office: 66 E. South Water St., Chicago, Ill.

SAFE • HEAVY • STRONG

J-72 SPEED LATHE

VEXATIOUS and costly breakdowns of scarce and much-needed school shop equipment can often be avoided if students are impressed with the need of observing a few simple operating precautions.

For example, it is extremely important that the J-72 Lathe, illustrated, always be operated at the proper speed. In determining the correct speed, consideration should be given to the kind of wood used, the operation performed, and the size of the article being turned. The latter is especially important. Selection of speeds is made easily on this lathe by means of the 4-speed motor control.

Be sure that the tool rest is tightened securely before starting the lathe. Keep the tool rest close to the work, but never attempt to adjust the rest when the lathe is in motion.

Use a mallet to drive the spur center into the stock. A metal hammer will burr its edges and prevent if from fitting in the spindle properly. Never drive the stock into the spur center when it is in the lathe. Such practice is harmful to the bearings. Finally, do not wear loose clothing when running a lathe as it can endanger the operator and also damage the machine if caught in moving parts.

YATES-AMERICAN MACHINE COMPANY • BELOIT, WISCONSIN

Short Talks on Wood

PERSIMMON (*Diospyros virginiana*)

Well known for its distinctive, edible fruit A close relative of the ebony tree. The wood is very heavy, hard and strong. Close-grained. Takes an excellent polish. Heartwood is nearly black, the wide sapwood is white or yellowish.

Extensively used for bobbins and shuttles, handles and shoe lasts. Most golfers probably are not aware that the heads of their wooden clubs invariably are made of persimmon.

Is found in southeastern United States from Florida up to Rhode Island and west to Kansas and Texas. Thrives best on light, sandy, well-drained soils.

A medium-sized tree which rarely exceeds 60 feet in height and 18 inches in diameter. Usually has a small, rounded top, short trunk and somewhat crooked branches.

The bark on the trunk is dark brown or nearly black and is broken into thick, square blocks or plates, having a scaly surface. The leaves are simple, alternate and oval. They are 4 to 6 inches long, smooth margined and pointed at the tip. Dark green and glossy above, pale and hairy beneath. Bears small, yellowish, bell-shaped flowers in May which have a gardenia-like odor.

The fruit for which this tree is so well-known is a reddish-yellow, pulpy berry about 1 to 1½ inches in diameter. Before it is ripe it is hard, green and astringent. When thoroughly ripe it is very sweet and delicious.

To date, forty-five brief articles similar to the one above and dealing with the more commonly used woods have appeared in these ads. As in the past, we continue to invite your suggestions as to the species of wood you would like featured in this series.

YATES-AMERICAN

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

The Skilled Mechanic and Modern Industrial Trends

ARTHUR B. MAYS*

From earliest times in the history of civilization to the rise of machine industry all industrial production came from the skilled hands of craftsmen. Division of labor was slight and craftsmen were creative artists as well as skilled mechanics. Handicraft production existed as the sole means of manufacture for at least three thousand years, and machine industry is not yet two hundred years old. In its modern form it has been in existence less than one hundred years. During the past fifty years industry has been almost completely transformed and the function of the skilled craftsman has been greatly changed. Skilled mechanics are still needed in large numbers but in many factories they are not directly concerned with manufacture but chiefly with maintenance. As machines become more specialized and more nearly automatic in operation, maintenance becomes increasingly important and demands greater expertness and broader technical knowledge. Thus growth in the use of complex machines in manufacture increases the importance of the skilled mechanic in the factory even though the relative numbers of such workers in factories may continue to decline.

Because of the new functions of the skilled mechanic in factory production many observers have been misled as to his importance in modern industry and the need for making provision for his thorough training. Some educators and publicists, after visiting large factories which manufacture standardized products and observing that from 80 to 95 per cent of the workers are *operatives* and not skilled mechanics, have too hastily concluded that the world no longer needs craftsmen and there is no further need for organized schemes of industrial education to train skilled mechanics. During recent years writers have frequently stressed the large and growing numbers of industrial workers who can learn their work within a few hours or a few days and have seemed to conclude that they have presented a complete account of the situation concerning industrial workers and their training needs. A typical statement of such a writer is the following appearing in a series of topical paragraphs distributed among graduate students in a university class in administration of secondary education: "Percentage of jobs requiring little or no preliminary training of a specific type has been variously estimated from 15 to 95 per cent. *Important in considering vocational education in high schools.*" This source further says: "American Youth Commission studies indicate that 'Not more than 5 per cent of all workers in industry require skilled training and that approximately 95 per cent of these are now trained on the job under the supervision of a foreman . . . a recent survey in one of our centers of eleven hundred occupations requiring no experience showed that 77 per cent required no formal education, and less than 1 per cent required trade school education. . . .' These facts mean that for a vast majority of youth the high schools need not be concerned primarily with specific vocational training in a strict sense, but would profit most by emphasis upon general education basic to vocational training, as well as to other functions of secondary education. The high schools should concentrate their vocational training upon a program of generalized vocational education which would be applicable to a family of occupations."

The truth of the matter has been made more obscure for the casual observer by the failure of industrial management itself to differentiate clearly between skilled work and semiskilled work. Fryklund, in a study of Minneapolis industries found that: "The older occupations are affected by new processes and inventions, and new occupations are constantly appearing. Some of the trades are still in existence but the new types of workers arising as mass-production increases are not clearly distinguished in terminology or in duties from the older craftsmen. The first efforts to define the meaning of these terms revealed the greatest confusion. The common designators and pay-roll terms were found to vary greatly. Writers, too, appear confused and plant managers themselves are not consistent — the terms used in the several departments of the same factory often being inconsistent."[1] Fryklund further points out that "What constitutes a trade as distinguished from specialized industrial work should be perfectly clear to anyone who attempts a discussion of industrial training problems."[2]

A careful study of duties and characteristics of factory workers in the Minneapolis area led to the adoption of the traditional classifications of *skilled mechanic, semiskilled operative,* and *unskilled worker.* But it was found desirable to subdivide skilled mechanics and semiskilled operatives into two groups each as *A–B* and *C–D,* respectively, defined as follows:

"Skilled Mechanics — Class *A* includes persons who are masters of their trades, thoroughly understand their assignments, and are competent to work without immediate supervision. Experimental jobs and the highest grade of production or tool work, requiring general knowledge of all machines, tools, and materials, belong in this class. Thus jobs requiring the exercise of considerable judgment, of accuracy without the use of jigs, and of initiative within the trade belong to Class *A* mechanics.

"Class *B* workers are as efficient as those of Class *A* on certain jobs, but their work is partly preplanned and demands some supervision. The workers need to know machine speeds, materials, how to read blueprints, and how to use precision instruments such as micrometers and gauges. Heavy but accurate work and small or medium-sized work requir-

*Professor of Industrial Education, University of Illinois, Urbana, Ill.

[1]Fryklund, Verne C., *The Selection and Training of Modern Factory Workers,* University of Minnesota Employment Stabilization Research Institute, Minneapolis, The University of Minnesota Press, 1934, p. 8.
[2]*Ibid.,* p. 8.

ing accuracy where tools are not preset, fall into this class. Frequently work in this class becomes repetitive to the extent of a few parts, but it is not as highly repetitive as most of the work of a still lower class.

"Semiskilled Operatives — Class *C* includes the higher types of machine operatives rather than mechanics. These workers perform highly repetitive operations, the same operations being repeated, by machine or by hand, day after day and week after week. They require considerable ability in the use of gauges and other methods of control. The work is usually preplanned, and tools are usually preset, but the operatives understand the machines and can change tools when necessary.

"Class *D* jobs are very simple and highly repetitive. Speed and manipulative dexterity are necessary for effective performance. Only a brief learning period (two weeks or less) is required for mastery. Such jobs are numerous in the present industrial organization."

In this classification, Class *E* includes the unskilled worker who is described as, "Those workers who are usually called laborers, unskilled workmen with no particular training. Jobs requiring no skill and little accuracy or knowledge come in this class. The jobs are rough, simple, and require a minimum of time to learn."

These five classes were distributed in the industries studied approximately as follows: *A–B* 10 per cent, *C–D* 80 per cent, and *E* 10 per cent. A further breakdown showed Class *A* 2.8 per cent, *B* 7.8 per cent, *C* 33.7 per cent, *D* 44.5 per cent, and *E* 11.1 per cent.

Before sweeping generalizations are made from these and similar data based upon factory production it is well to consider certain factors often ignored. There are scattered about over the nation small factories making highly specialized products which require skilled mechanics of the Class A–B type for nearly all production. In such factories all products are *custom made* and there is little or no standardization. It is probable that there will always be need for such factories. The semiautomatic machines used in large plants manufacturing standardized products are often made in such factories. A machinist working in such a plant told the writer: "We have never made two machines that were exactly alike, and all of us are all-round, skilled mechanics."

Furthermore, the increase of standardization of products inevitably results in ever greater distribution and use of such products and this calls for an increasing number of skilled repairmen throughout the nation. As mechanisms commonly used become increasingly complex, repairmen must be increasingly intelligent and skillful. Industrial production is ever changing; inventive genius is ever visualizing new things, and before new things can be produced in quantities by standardized processes they must first be built by skilled craftsmen. It seems obvious that there will always be need for skilled craftsmen and such mechanics must increasingly know more, be more versatile and more skillful as engineering progress is made.

Passing from factory production to that other large division of industry, the *custom trades*, as they are sometimes designated, we find quite a different situation. There is evident in these trades a trend toward specialization but it, of necessity, is a slow trend and is greatly limited by the inherent character of the trades involved. When one considers the custom tailor, the engraver, and watchmaker, the electrician, the plumber, the stone mason, the brick mason, the plasterer, the decorator, the tinsmith and coppersmith, and the carpenter, the fact that the world is still in need of large numbers of skilled mechanics becomes evident. In the United States Occupational Census figures for 1930 (the latest available at the moment) there are 12 classifications which clearly indicate skilled craftsmen. Comparing the numbers of these 12 designations for 1920 and 1930 the following table shows the general situation.

Census Listing of Twelve Skilled Trades

	1920	*1930*
1. Cabinetmakers	45,511	57,897
2. Carpenters	887,379	929,426
3. Compositors, linotype and typesetters	140,165	183,632
4. Pressmen and plate printers	18,683	31,215
5. Upholsterers	29,605	51,452
6. Tinsmiths and coppersmiths	74,968	83,427
7. Painters, glaziers, and varnishers	323,032	528,931
8. Toolmakers, die setters, and die sinkers	55,092	78,794
9. Machinists	801,901	640,289
10. Electricians	212,964	280,317
11. Plasterers and cement finishers	45,876	85,480
12. Plumbers, gas and steam fitters	206,718	237,814

The total number of skilled mechanics for these 12 designations in 1920 is 2,841,894 and for 1930 it is 3,188,674. This is an increase of approximately 12 per cent for the decade. During the same period the total number engaged in "Manufacturing and Mechanical Industries" was for 1920 12,831,879 and for 1930 14,110,625 or an increase of approximately 10 per cent. Thus the 12 census groups which unquestionably designate skilled mechanics increased during that decade faster than the total number of workers in the manufacturing and mechanical industries. These figures suggest that there is still a need for the skilled mechanic in the United States and that there probably will be such need for some time to come.

It appears, then, that notwithstanding the remarkable development of machine production and increased specialization of process during recent years there are needed large numbers of class A–B skilled mechanics in at least four important areas of the *mechanical industries*, namely, (1) maintenance of production equipment, (2) production of specialized products requiring skilled craftsmen, (3) repair trades, and (4) custom trades. While it is clear that the relative numbers in each of the four areas will vary as new developments occur in industrial practices, it is not clear that a time will come in the near future when any of the four will cease to be important.

With reference to the *C–D* classification of the Minnesota study there are important considerations often neglected. It is too frequently assumed that because workers in these classifications can acquire sufficient *initial* training to begin earning within a relatively short time that skill is not an attribute of their occupations. If skill is an important factor and if skill means more than mere habitual muscular co-ordination and dexterity, then their training also has certain important implications for industrial education. What then is skill in industrial production and how significant is it in the success of the semiskilled operative? Selvidge and Fryklund define skill as a "thoroughly established habit of doing a thing in the most economical way"[3] and they treat its growth as being primarily a matter of habit formation. They stress the two elements of "most economical way" and of forming a habit. Fairchild, however, accepts Pear's definition as the basis of her study of industrial skill which is, "The integration of well-adjusted performances adapted, under varying situations, to the attainment of a desired result" and comments that, "While it consists primarily of habits it is more than merely a congeries of habits. The habits, at least, must be the kind to ensure adaptation.[4]

If the latter definition of skill be accepted, and the writer feels that it is the more accurate of the two, then the skill developed by the "semiskilled" operative is of a more complex character than many writers seem to realize. Furthermore it calls for more serious attention by those who employ and train such workers than is usually given to it. The degree of skill developed in semiskilled jobs often has most important effects upon the worker and plays a large part in production costs and quality of products. Fairchild, after careful study of these aspects of the skills of the semiskilled factory jobs concludes that "Where skill is given play, it becomes in the workman developing it *much the greatest source of his satisfaction.* Satisfaction in wage and satisfaction in the conditions of work supplement it or not, as the case may be. *But definitely they tend to be counted as subsidiary.*" She concludes from the whole investigation that "The results of this study suggest that failure to utilize men's capacity for skill development is like failure to utilize the capacity of a waterfall flowing past one's factory doors, or of the coal in one's bins to its fullest extent. It is a waste of a natural utility directly at hand, whose use would be advantageous to everyone concerned."[5]

If the skill of the factory operative is of the importance suggested by Fairchild's study, leaders of industrial education as well as in-

[3]Selvidge, Robert W., and Fryklund, Verne C., *Principles of Trade and Industrial Teaching* (Peoria: The Manual Arts Press, 1930), pp. 180–181.

[4]Fairchild, Mildred, *Skill and Specialization — A Study in the Metal Trades*, Doctor's Thesis, Bryn Mawr College, 1930 (Reprint from *The Personnel Journal*, Vol. IX, Nos. 1 and 2, June and August, 1930).

[5]*Ibid.*, pp. 43–44.

dustrialists clearly should give far more consideration to its development than they now do. If the specific skills needed for success by the semiskilled operative cannot be developed anywhere except "on the job" then the two questions arise immediately, (1) can there be provided any pre-employment experiences which will facilitate the learning on the job, and (2) can the industrial educator contribute anything directly to the teaching of the operative on the job?

There is strong evidence, accumulated over the years during which both industrial arts and vocational-industrial education have existed in the schools, that the schools have both the ability and the obligation to contribute to the training of both the skilled and the semiskilled workers of industry. Careful follow-up studies of industrial workers who have been pupils in trade schools and in high schools offering strong programs of industrial-arts courses amply show the ability of schools to make significant contributions to the preparation of successful workers in industry.[6]

Strong industrial-arts offerings in junior and senior high schools, part-time programs, apprenticeship programs supervised by representatives of the schools, full-time trade courses and foremen training courses, all constitute means used by the schools to contribute to the training of workers for the growing demand for intelligent and efficient foremen, mechanics, and factory operatives.

[6]See, for example, *The Occupational Adjustment of Vocational School Graduates*, AVA Research Bulletin No. 1, 1940, American Vocational Association, Washington, D. C.

Since there is little evidence to suggest the disappearance of the skilled mechanic and since large groups of semiskilled operatives will probably in the future need, in their specialties, skill involving technical knowledge of a higher type than they often now possess, industrial education in the public schools will doubtless continue to grow in range and importance so long as industry remains a major factor in the economic and social structure of civilization. Not only will the basic industrial understanding given by thorough industrial-arts courses increasingly be needed for all types of workers, but specific pre-employment trade training for skilled mechanics and various sorts of part-time upgrading for all workers doubtless will be of growing necessity in the years immediately ahead.

Making a Glider Pilot

O. A. HANKAMMER*

War always has had its special training requirements, its innovations, and its new techniques. The present war, more than ever, needs technically trained men. Recently General Sommerval stated that 62 out of every 100 men must be trained in some technical aspect if our war machine is to function effectively. Aviation is recognized as an important field in which much technical instructing must be done. Schools and colleges developed such programs, many of them long before Pearl Harbor.

At Kansas State Teachers College of Pittsburg, aviation instruction began in 1938 as a phase of a comprehensive auto-mechanics program. The instructor of auto mechanics acquired a pilot's license and qualified himself through government ratings as an instructor in the field of aviation. Other instructors did likewise thereby providing a trained and competent staff by the time the institution was ready to contract to train CPT pilots and later glider pilots.

Until recently glider pilots were limited to the few who could afford or, were interested in gliders mainly as an exhilarating sport. With gliders becoming a possible means of transporting troops, glider training took on a new and military significance. The problem of glider training was one of personnel selection and content selection. The personnel, to a large extent, is made up of individuals having had some flight training in CPT or as aviation cadets. Certain trainees have been accepted without previous aeronautical training. All have passed the Army physical examination and have a vision of at least 20/40, correctible to 20/20.

The training program is broken into two phases, preglider training and advanced training. The preglider training, in turn, has two main aspects, namely, specialized flying and basic ground school. Flight training in the preglider work at Kansas State Teachers College is given in light planes such as *Aeronca* L3B's and *Piper* L4's, obviously, under government approved conditions.

Flight training consists of 35 to 40 hours of instruction in the air with emphasis on dead-stick landings. Other specialized phases of glider training deal with the art of *slipping*, various glide patterns, and making spot landings. The pilot spends many hours taking off, *killing* his engine, and going through maneuvers for various elevations and at various distances. At all times, the pilot has a specific objective to reach regardless of the point at which the instructor may *cut* the engine. This calls for skill and good judgment on the part of the pilot.

The basic courses for the ground school are *aircraft maintenance, meteorology,* and *air navigation.* Classes are conducted in groups of approximately 25 men. No pilot is considered for advanced training until he gives evidence of an adequate understanding of the ground school subjects.

The glider pilot is given a five-hour course in *aircraft maintenance.* The essential content of this course is indicated in the following outline.

Aircraft Maintenance

I. Structures
- A. Fuselage
  1. Structural features
  2. Inspection and maintenance
- B. Engine mounts
  1. Structure
  2. Maintenance
- C. Wings
  1. Structure
  2. Inspection and maintenance
- D. Stabilizers
  1. Structure
  2. Maintenance
- E. Flight control surfaces and wing flaps
  1. Structure
  2. Maintenance
- F. Flight control mechanisms
  1. Operation
  2. Alignment
  3. Maintenance
- G. Landing gear
  1. Structure
  2. Maintenance
- H. Tires and tubes
  1. Casings
  2. Tubes
  3. Maintenance
- I. Materials
  1. Fabrics
  2. Wood
  3. Metals
  4. Plastics
- J. Wheels
  1. Structure
  2. Maintenance
- K. Brakes
  1. Types
  2. Maintenance
- L. Cockpits and cabins
  1. Inclosures, windshields, and windows
  2. Doors
  3. Ventilators
  4. Seats
  5. Maintenance
- M. Cowling and fairing
  1. Cowling
  2. Fairing
  3. Maintenance

*Kansas State Teachers College, Pittsburg, Kans.

N. Shielding and bonding
1. Shielding
2. Bonding
O. Towing, mooring, and handling
1. Towing and handling
2. Mooring
P. Hydraulic jacks
1. Use
Q. Cleaning
1. Aqueous cleaners
2. Volatile cleaning fluids
3. Methods
R. Lubricants
1. Classification
2. Grades
S. Insignia and markings
II. Inspection
A. Forms
B. Classification
C. Symbols
D. Technical orders

Gliding has such a marked dependence upon meteorological conditions that no glider pilot could expect to function efficiently except as he *knows his weather*. The importance of meteorology for the pilot is emphasized by the time devoted to the subject, namely, 18 hours. The outline of this course gives the topics and general content with which the pilot must become familiar.

Meteorology

I. Major factors
A. Temperature
1. Scales
2. Measurement of heat
3. Insolation
4. Variation with height
5. Transport of heat
6. Effect of temperature on altimeter
B. Pressure
1. Standards and scales
2. Pressure gradient
3. Altitude
4. Altimeters
5. Effect of pressure on weather
C. Winds
1. Measurement
2. Coriolis
3. Friction
4. Surface winds as an indication to winds aloft
D. Moisture
1. Water vapor
2. Three states of water
3. Changes of state processes
4. Cloud formation
5. Precipitation
6. Effect on relative humidity by change of temperature
E. Clouds
1. Clouds and weather
2. Classification of clouds
3. Composition
4. Form
5. International classification
F. Air masses and fronts
1. Air mass
2. Source regions
3. Designations
4. Front
G. Frontal weather
1. Stationary front
2. Cold front
3. Warm front
4. Occlusion
5. Fronts aloft
6. Squall line
H. Fog (major hazard)
1. Saturation
2. Haze
3. Air mass fog
4. Radiation fog
5. Advection fog
6. Steam fog
7. Frontal fogs
I. Thunderstorms (major hazard)
1. Thunderstorm cloud
2. Hail
3. Mechanics of thunderstorm
4. Classification of thunderstorms
5. Tornadoes
6. Hurricanes
J. Icing (major hazard)
1. Kinds of ice
2. Hazards and annoyances
3. Ice formation
4. Deicers
II. World weather

Besides knowing how to maintain his aircraft and understand the meteorological conditions bearing upon flying, the glider pilot is taught how to find his way along a given path or through uncharted skies. The glider pilot receives a five-hour course in *Air Navigation*. The outline indicates the areas considered in this important field.

Air Navigation

I. Navigation methods
A. Methods used in air navigation
1. Pilotage
2. Dead reckoning
3. Radio navigation
4. Celestial navigation
II. Navigation factors
A. Globe, maps, and charts
1. Definitions
2. Longitude and latitude
3. Map projections
4. Aeronautical charts
5. Chart reading
6. Sectional and regional charts
B. Time, direction, and bearing
1. Time
2. Time and longitude
3. Time zones
4. The 24-hour system
5. Direction and bearing
C. Compasses and compass errors
1. Magnetic compass
2. Earth-inductor compass
3. Variation
4. Magnetic deviation
5. Errors of compass in flight
D. Time, speed, and distance
1. Time, speed, and distance
2. Knots and miles per hour
E. Effect of wind
1. Definitions
2. Vector diagrams
3. Compass heading
III. Dead reckoning
A. Elementary dead reckoning
1. Advantages
2. Air speed meter
3. Altimeter
4. Turn indicator
5. Clock
6. D–3 computer
7. Thermometer
8. Elementary methods
9. Line of position and fix
10. Steering a range

The glider pilot who successfully completes his flight training and ground school in the preglider portion of the glider training program goes on to the advanced school where he will be given flying experience with an engineless *Aeronca* and other forms of gliders. In the advanced program, the pilot also is given a thorough knowledge of instruments used in flying. Having prepared himself and demonstrated that he is competent for the important specialized task in this new arm of the air, the glider pilot is given his *wings* bearing the initial G.

A COMMENCEMENT ADDRESS— "NOW, WHAT IS THERE TO DO?"[1]

CLEMENT J. FREUND*

Tonight you graduate. Now what is there to do? How and where do you go on from here? Those are questions each of you must answer for himself, but I do think there are a number of important things to keep in mind when you prepare your answer. Perhaps you think, "Now he's going to talk about the war." No. Let's forget the war for tonight. This war will come to an end; wars always do. Newspaper columnists, and learned people who lecture and write, tell us what kind of world we shall have after the war. I am neither a columnist nor learned, and shall not try to tell you what the world will be like when the Germans and the Japanese have given up. I firmly believe that the world will be very much better. It will most certainly be a much different world. A war cannot pass over the face of the earth and leave it as it was.

And you must all be ready for the change; you must be healthy, vigorous, eager and alert, and you must be trained.

But how can you prepare for a world when nobody knows what kind of world it will be? The task is surely perplexing, but you will

[1]1942 Commencement Address, Cass Technical High School, Detroit, Mich.

*Dean, College of Engineering, University of Detroit, Detroit, Mich.

make no mistake if you recognize, in making your plans, a trend or movement which has grown consistently for one hundred and fifty years or longer, a trend which has gone on without interruption through prosperity and depression, war and peace, and the rise and fall of governments. I am sure that this trend will continue regardless of far-reaching readjustments which may be expected in our industries and in our mode of life. I refer to the tendency of all kinds of work to become constantly more efficient, but likewise more difficult and complex, because of improved techniques resulting from scientific studies, ordinarily called research. Let me explain what I mean.

About 120 years ago a young French artillery officer named Carnot amused himself with the study of a science called thermodynamics, which has to do with the mutual relations of heat and force. Scholars of the time thought it was interesting in an abstract and academic sort of way, but practical people paid no attention to Carnot and his work because his work apparently had no bearing on everyday life. I suppose that thermodynamics had about as much significance at that time as the study of Assyrian hieroglyphics has today.

Watt and Newcomen had invented their steam engines before that time and many engines were in use, but they were woefully crude and inefficient. The engines were built by machinists and fitters. And why not? They were made of metal and, obviously, workers in metal should build them.

And then somebody, I don't know who it was, conceived the idea that the steam engines might be much improved by applying Carnot's thermodynamics to their design and construction. That was the beginning of heat power engineering. Developments since then have been incredible. Without the help of engineers and their applied science, no machinist or mechanic could possibly produce gas or Diesel engines for our automobiles and airplanes, or the huge turbines in the power plants of the Detroit Edison Company.

A similar evolution has taken place in all fields of work. Scientific study is the measure of the difference between the pony express and the telephone or the radio; between alchemy, and rayon and nylon fabric and, we hope, synthetic rubber; between the village blacksmith and the metallurgist with his pyrometers and his red and green signal lights; between the ignorant and pauper herdsman and the up-to-date stock farmer; between the blood letting barber and the modern surgeon. I could go on. There is less and less opportunity for the man who can use only his arms and his back, and more and more opportunity for the man who knows about the complicated ways of doing things. It makes no difference what kind of occupation you are thinking about; you will find that experts are taking it over. The man who knows is in charge of the automobile, airplane, steel, chemical, and power industries; he is in charge of banking, retailing, transportation, insurance, finance, everything without exception.

For you this means just one thing. Each one of you must become an expert. Each one of you must continue to educate and to train yourself. How you will do it depends upon your aims, but in one way or another it must be done.

If you plan to become a patternmaker or a machinist or an electrician or a toolmaker, if you plan to go into any one of the crafts, you should attend the regular evening schools, or register for one of the defense courses which the United States government has established in the important industrial centers, or apprentice yourself in one of the Detroit industries, if you should be fortunate enough to have the chance.

If you wish to be what is often called a technician, such as a draftsman, or a trouble shooter, or a power plant, substation or radio operator, or an erection mechanic, look for an evening class in which you can learn to manipulate and thoroughly to understand the instruments with which you must work, or still better, enroll if you can in one of the technical institutes.

If you hope to get into the professional field, and to study the sciences and related subject matter for application in the industries, go to college and earn a degree in chemistry, physics, biology, engineering, architecture, or the like.

And I trust that I shall not disturb this technical atmosphere too much if I say that I think it would be excellent if at least some of you undertook general and liberal studies in college, to acquire a broad education before proceeding with advanced courses in some special profession.

No matter what you propose to do, each one of you needs additional training and much of it. Don't imagine that your faculties are already sharp enough. Don't breathe a sigh of relief because your studies are now all behind you. Go in for more and still more schooling, all your life long. Otherwise, I can assure you without the slightest hesitation that you are already eliminated, out of the picture, sunk.

I assume that all of you wish to succeed. Your parents, relatives, friends, teachers, all expect you to succeed. Fortunately I can tell you just how success is achieved. Unfortunately, however, it is not easy to do; it is very hard. If it were easy, everybody would succeed. In order to be successful you must excel, you must be a better and a stronger man or woman, and you must do better work than those with whom you are associated.

Look about you and estimate the prevailing standard of character and deportment, and exceed that standard. Look about you and estimate the prevailing standard of accomplishment and exceed that standard too. If you work in a milling-machine department and the scrap average in that department is 4 per cent, see to it that scrap from your machine is never more than 2 per cent. If there are only two men in your department of twenty who can assemble a special type of oil pump, be sure that you are one of the two. If a number of young men in your drafting room attend evening school on Tuesday and on Thursday, make it a point to attend on Monday, Wednesday, and Friday. Make it your business to be the most diligent, the quickest, the smartest, the most resourceful man in the place.

But be modest about it. Don't talk about your ambitions. Most people, after all, do not exert themselves and don't care to. They have little or no ambition and dislike those who have, because ambitious people create a contrast and emphasize their own mediocrity. You can gain nothing by antagonizing those with whom you must work and live.

I have had nothing to say, or very little, about character and personality and right and wrong, and all that has to do with a good life. But I do most firmly believe that good living is vastly more important than good work. The difficulty is that I can do little or nothing for your character and personality. These have been carefully formed by the efforts of your parents and teachers during the years of your life, and nothing which I might tell you tonight could improve upon their work.

And now, finally, let me congratulate you all most heartily. I must congratulate you, of course, for completing your high school studies, the long and arduous series of recitations, laboratory hours, term papers, examinations, reports, projects, and assignments.

But more particularly, I wish to congratulate you because you have attended the Cass Technical High School, and because I know that in this school you have been taught how to work. I wonder if you realize that it was no longer considered smart or fashionable to work hard. Only those worked who were dull and slow witted. The thing to do was to be clever, to talk yourself into a good living somehow or other, to get a living out of the Federal Government, to get something for nothing. To earn a living by legitimate work was to gain the contempt of those who had found easier ways of doing it.

The war has changed all this, of course. Everybody has to work again and nobody considers it a disgrace.

The Cass Technical High School is one of a few that had remained in which work was never despised. Here you learned to work, here one always could learn how to work, and here you learned the honor and the dignity of work. I promise you that time and time again, especially in the years that lie immediately ahead, you will be amazed by the enormous advantages which you enjoy because you know how to work, and because you have formed the habit of working, and keeping at a job until it is finished.

I wish you all a happy life and success in your careers; and should it be, not before very many years I hope, that the trustees of the University should find my services no longer of use, and should it be that one or the other of you has in the meantime become president of the General Motors or the Chrysler Corporation, or of the Ford Motor Company, I shall come to see you about some little job to occupy my time and to bring in a few pennies.

R is for Rithmetic

H. ERNEST CONKLIN*

Recent months have brought the scattered publication of a number of discussions based upon the need for, the nature of, and the function and results of tests for personnel for both the armed services and for industry in the war emergency effort and in connection with postwar problems. For the most part, and rightly, the tests resorted to are mathematical, since war is a matter of scientific calculation. Announcement that Hitler had trained his men for several years before the beginning of the war is not surprising, and we should not forget that he had a very practical system of trade school and university preparation which had been established in the days of Bismarck. We, on the contrary, have hardly a beginning. Yet we may ask "are we too late with too little? Or is there a ready, efficient way to overcome the handicap?"

What price schooling: How little is enough? What is good enough? For what? Will guesswork and rule of thumb raise the batting average? If emergency is the mother of resourcefulness, what are her living, active progeny? Perhaps the immediate problem is that of "bracketing" that combination of brain and brawn necessary for the present requirement, expending it, or, rather, employing it with true rationing economy, and replenishing at the first opportunity. Clearly, the barrel isn't being scraped thus far; but after Admiral Nimitz has gone over the supply and, the rich mixture having been skimmed off for management and the like, and the services have taken what is needed, what's left for the backlog? *Can* a job be broken down so that its components can be performed by untrained hands? Are we good enough ants?

Here is a large industry of prime necessity, successfully operated through many years of growth natural to incidence of natural resources in the vicinity, its corps of workers supplied during peacetime by peacetime processes; converted now to war production, much enlarged, required to draw on a large town for additional force of adaptable "civilians," themselves needy and eager, pleading and patriotic, but unclassified. Who knows a hawk from a handsaw? They cannot themselves tell what they can do, but the press tells them of British spinsters in war work and they are assured.

What is the test, and what is it to show? What *does* it show? If the results of peacetime testing, as they are recorded by Stead,[1] make it appear doubtful that the facility in one skill make for facility in another, perhaps it is just as well that we start with *no* skill beyond what all skills require — ordinary elementary calculation. Where and what is that?

The *control* for the present testing is the result of testing the employees already in the plant, practically all of many years standing, some 2500, and of a considerable number of school children. The test was and still is of this description: a dozen exercises in uninvolved addition, subtraction, multiplication, and division; half a dozen each in addition and (or) multiplication and division of simple fractional and decimal figures; a mere handful in the most elementary algebraic substitution, the extraction of a perfect square root; 30 in all, to be performed in not more than 45 minutes.

Commencing the testing of considerable numbers at about the close of schools for summer, and, as it happened, when shipyard work was drawing vast crowds, we drew from schools, N.Y.A. centers, and unemployed skilled and unskilled men and boys spontaneously, by "grape vine" and Federal Employment Service, something more than 2000. Then came the substitution of women for men, the number growing from a trickle to a stream of women only. At the moment we are provided, therefore, with a test that shows both the combination and the separate figures. See Tables I, II, and III.

The results shown in these tables disclose many facts, some of them discomforting and some downright dismaying. The explanations of the facts are clear and warrant definite conclusions.

Ages	*No. Tested*	*Age*	*Average School Grade*	*Score*
To 25	1541	19.567	10.204	18.415
25–35	505	29.800	8.745	14.335
35–50+	359	43.100	8.206	12,596
All ages	2405	25.186	9.631	16.694

Table I. Pre-employment tests of 2405 men

Ages	*No. Tested*	*Age*	*Average School Grade*	*Score*
To 25	606	19.526	10.695	18.119
25–35	432	29.866	9.427	15.414
35–50+	220	40.210	9.700	15.197
All ages	1258	18.669	10.137	16.837

Table II. Pre-employment tests of 1258 women

Ages	*No. Tested*	*Age*	*Average School Grade*	*Score*
To 25	2147	19.556	10.384	18.343
25–35	937	29.830	9.076	14.854
35–50+	579	41.997	8.774	13.800
All ages	3663	22.975	9.806	16.720

Table III. Pre-employment tests of 3663 men and women

So-called compulsory education was instituted in Texas in 1915, with modifications in 1923. The figures show that compulsory education of the "progressive" variety means little more than a degree of articulate "self-expression" a cut above the literacy of the voluntary condition; but though the "spread" is greater, there is little evidence that cost accounting by the generality is likely to be more readily accomplished in town than Mr. Woodbridge found it 18 years ago on the ranch, or that the loan shark's percentage will become convincingly prohibitive to his clientele in the near future.

There are more figures. For results of tests given to men and women with preparation in addition to high school training — defense, business schools, etc., but no college work, consult Tables IV and V.

Ages	*No. Tested*	*Age*	*Average School Grade*	*Score*
To 25	58	19.155	10.776	20.621
25–35	26	30.154	9.000	19.500
35–50+	18	43.056	9.500	19.722
All ages	102	26.176	10.098	19.980

Table IV. Tests of men who had some preparation plus high school training

Ages	*No. Tested*	*Age*	*Average School Grade*	*Score*
To 25	68	20.207	10.931	21.310
25–35	31	30.58	9.936	18.387
35–50+	8	36.000	9.250	18.000
All ages	107	26.765	10.279	19.618

Table V. Tests of women who had some preparation plus high school training

For results from men matriculated in college but not proceeding beyond the first year (i.e., largely prepared in high school for technical school), see Table VI.

Ages	*No. Tested*	*Age*	*Average School Grade*	*Score*
To 25	57	19.404	11.965	24.965
25–35	12	29.833	11.916	21.583
35–50+	6	48.500	12.333	20.667
All ages	75	23.400	11.9066	24.08

Table VI. Men who had some college work in addition to high school

For women matriculated in college but not proceeding beyond the first year (largely normal schools).

*Division of Education in Industry, the University of Houston, Houston, Tex.

[1]Stead, W. H., Charlte, C. L., and others, *Occupational Counseling Techniques*, American Book Company, 1940, *passim*.

Ages	No. Tested	Age	Average School Grade	Score
To 25	20	20.250	12.000	20.900
25–35	15	31.667	12.267	17.933
35–50+	3	41.333	12.000	21.000
All ages	38	26.184	12.1026	19.737

Table VII. Women who had some college work in addition to high school

For results from men with one year of college completed (probably with a course in mathematics included) see Table VIII.

Ages	No. Tested	Age	Average School Grade	Score
To 25	41	20.268	13.220	25.220
25–35	18	28.944	13.333	24.056
35–50+	12	43.083	13.500	23.167
All ages	71	26.352	13.296	24.592

Table VIII. Men who had completed one year of college work

For results of tests of men and women (414 persons) with some training in addition to high school, see Table IX.

Ages	No. Tested	Age	Average School Grade	Score
To 25	220	20.964	11.864	22.790
25–35	125	30.232	11.200	20.636
35–50+	69	42.000	11.754	21.059
All ages	414	24.135	11.717	21.850

Table IX. Men and women who had some college work in addition to high school

Perfect scores, however, were not confined to people in these groups. One hundred and thirty four (a remarkably low percentage, .0365) were distributed thus:

Ages	No. Tested	Age	Average School Grade
To 25	68	19.559	11.721
25–35	19	31.265	12.158
35–50+	12	43.833	13.167
All ages	99	24.040	11.980

Table X. Men who made perfect scores

Ages	No. Tested	Age	Average School Grade
To 25	14	20.000	11.182
25–35	12	31.417	11.925
35–50+	9	43.000	12.000
All ages	35	29.829	11.629

Table XI. Women who made perfect scores

Ages	No. Tested	Age	Average School Grade
To 25	82	19.634	11.622
25–35	31	31.323	12.065
35–50+	21	43.191	12.667
All ages	134	26.075	11.881

Table XII. Men and women who made perfect scores

Next, does retest show anything? Tables XIII and XIV show the increase in scores, broken down and grouped as to grades and as to ages.

Grades	No. Tested	Increase in Score
5– 6	10	3.9
7	9	3.44
8	20	2.70
9	9	5.66
10	5	2.22
11	13	5.615
12	6	.333

Table XIII. Increase in scores on retesting the men. Grouped by grades

Ages	No. Tested	Increase in Score
To 25	44	4.432
25–35	20	2.45
35–50+	8	3.00
All ages	72	3.007

Table XIV. Increase in scores on retesting the men by age groups

One man, age 18 with 12 years in school, had scores 29 and 30, brushing up on square root.

Tables XV and XVI show the increases obtained by women on retesting. They are grouped by grades and by ages.

Grades	No. Tested	Increase in Score
5– 6	5	6.6
7	8	4.5
8	15	5.6
9	10	7.8
10	18	7.058
11	35	4.714
12	9	3.553

Table XV. Increase in scores on retesting the women. Grouped by grades

Ages	No. Tested	Increase in Score
To 25	43	5.116
25–35	46	6.130
35–50+	11	7.000
All ages	100	5.790

Table XVI. Increase in scores on retesting the women. Grouped according to ages

One 18-year-old girl with 12 years of schooling raised her score of 25 to 30.

Tables XVII and XVIII show the increases in scores made by both the men and women.

Grades	No. Tested	Increase in Score
5– 6	15	4.866
7	17	3.325
8	35	4.029
9	20	6.050
10	23	5.869
11	48	5.000
12	16	3.000

Table XVII. Increase in scores on retesting the men and women. Grouped by grades

The time that elapsed between tests varied from one day to three months, and in the great majority of instances there was some review of one sort or another. If allowance be made for chance informational leaks (the test consists of four variant papers in which only quantities are changed), the increase is disappointing unless one realizes that much more than the good will of the candidate governs the matter of review. Thoroughgoing, intensive review is necessary. Apparently women make a greater and more consistent effort at it than do the men; but even theirs does not produce the perfect score. What *does* produce it, in better than 50 per cent of instances, is the 45 hours spent in refresher courses in the plant.

Ages	No. Tested	Increase in Score
To 25	57	7.281
25–35	66	5.015
35–50+	19	5.316
All ages	142	4.663

Table XVIII. Increase in scores on retesting the men and women. Grouped by ages

One other matter now arises, since commencement of the draft for boys of 18 to 20. Regrouping gives the results shown in Tables XIX, XX, and XXI.

Ages	No. Tested	Age	Average School Grade	Score
To 20	1024	18.354	10.531	17.763
20–30	514	28.839	8.702	14.897
30–40	363	37.570	8.612	13.595
40–50+	246	48.805	8.341	12.427
All ages	2147	26.884	9.517	15.762
All ages except those "To 20"	1123	34.751	8.594	12.974

Table XIX. Regrouping for men

Industry, then, must train for its purposes, starting with what it has; it will be a mercy if it can use its leaven of well-schooled personnel to assist with the many less well schooled, and it is fortunate if it can organize groups so amenable to training as the applicants have demonstrated themselves to be. Industry must test, if it can afford to discriminate, for present needs, and, if Viteles is right, for later efficiency.[2]

Statisticians who require larger figures may be assured that testing subsequent to the date at which the foregoing figures were taken continues to produce results which confirm what has been shown (we are now well over the 6000 mark), and demonstrate some very obvious facts, some less obvious but nevertheless pointed: that persons who have been allowed to elect mathematics in the schools have not elected it; that people who have kept calculation in use have not forgotten

[2]Viteles, Morris S., *The Role of Industrial Psychology in Defending the Future of America*, in Annals of the Amer. Acad. of Pol. and Social Sciences, Vol. 216, July, 1941, p. 158. "Contracts and even less formal agreements with labor frequently call for the reinstatement, on a seniority basis, regardless of performance, of employees laid off for lack of work. Under such conditions, mistakes made in selection are not easily corrected. Experience also shows that among the most troublesome of grievances are those involving the discharge of an employee because of *unfitness*. In such cases, management ordinarily finds little sympathy on the part of labor for its plea that the worker is incompetent. 'That,' says labor, 'is a matter which should have been settled prior to employment.'"

Ages	No. Tested	Age	Average School Grade	Score
To 20	710	18.746	10.532	18.601
20–30	1207	25.339	10.215	16.076
30–40	70	32.464	9.490	15.689
40–50+	223	44.946	9.368	15.592
All Ages	2844	27.346	10.086	17.579

Table XX. Regrouping for women

Ages	No. Tested	Age	Average School Grade	Score
To 20	1734	18.515	10.526	18.103
20–30	1721	25.488	9.822	15.725
30–40	1067	35.139	9.197	15.914
40–50+	469	46.970	8.829	13.932
All ages	4991	27.207	9.841	16.222

Table XXI. Regrouping men and women

procedures, but they are markedly in the minority; that people who have not kept it in use forget to the point of confusion in three years or less; that younger people recover more quickly than older; that business schools, normal schools, and the majority of current "defense" schools do not require even elementary training in calculation as prescribed curriculum; that even intensive refresher courses cannot be effective if too brief; finally, that in the light of the fact that would-be employees admit that their deficiency is of evil consequence not only with regard to the prospect for them in industry, Pestalozzi, Montessori, Froebel, and Rousseau, to mention none of the manipulators of their persuasions, prepared for neither war nor peace.

N.B. The article in *Fortune* for February, 1943, on women in war industry gives additional point to the consideration of the purposes and results of pre-employment testing. How soon may we look for trained women instructors in the shops? We shall need them.

What is Related Work?

HENRY McLAIN*

What are the related technical subjects in vocational carpentry? How are these related technical subjects taught? The vocational instructors are frequently confronted with these two questions. The answers are long and involved. This article has been prepared to give the parent and the student practical and definite illustrations of the answers to these questions.

The carpentry trade, like all other trades, is subject to continual change over a period of years. In spite of these changes, there are basic fundamental practices in the carpentry trade that have prevailed for years and will continue to prevail for years to come. These basic fundamentals furnish the subject matter that is taught as related technical information. The several areas that these subjects cover are: trade mathematics, trade science, care and use of tools, safety, employer-employee relations, trade ethics.

The following pages are sample instruction sheets for the related technical subjects. They have been carefully selected and condensed in order to show the phases of related work as undertaken in the vocational carpentry class of the San Bernardino Senior High School.

Before the instruction sheets are prepared, a careful trade analysis is made which assists the instructor in determining what information is to be used as subject matter. There is no technical information used unless it is directly related to the trade.

Trade: Carpentry — *Unit:* Mathematics
Topic: Estimating

Objective: To develop the ability to estimate the number of studs required for a certain building.

Information: Studs are the small vertical timbers, usually 2 by 4 in. in size, used in walls and partitions (extending between the upper and lower plates), to which the lath and siding are nailed.

Rule for Estimating the Number of Studs Required:

Determine the number of lineal feet of walls and partitions there are in the building, and add 25 per cent to this amount. The result will be the number of studs required. All openings are disregarded when estimating studs.

Questions:

1. The perimeter of a building is 137 ft. 11 in. There are 244 ft. 9 in. of partitions. How many studs are required?

2. The blueprints for a bungalow court indicate 12 units. Each unit is 22 ft. 0 in. by 37 ft. 9 in. in size. There are 86 ft. 7 in. of partitions in each unit. Estimate the number of studs required for the entire court.

Trade: Carpentry — *Unit:* Trade science
Topic: Fire stopping

Objective: To explain the purpose of fire stopping, and to define fire stops.

Information: Fire stops are obstructions provided in air passages between studs and joists, and are designed to interfere with the passage of flames up or across a building.

Because of long uninterrupted fluelike passages between the studs and floor joists, especially with balloon frame construction, it is possible for flames from a basement fire to gain access to these passages and work rapidly up through the building. At the various floor levels, the flames may find their way horizontally across the building in the space between the floor joists.

The Uniform Building Code requires that all fluelike passages must be stopped so that their length will not exceed 7 ft. The fire stops must be made from material of the same size as that forming the flue.

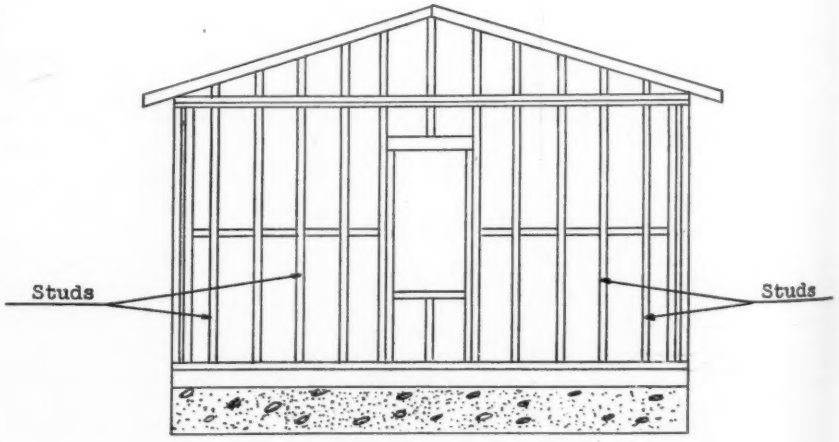
Questions:

1. Does solid bridging between floor joists act as a fire stop?

2. Is it necessary to nail fire stops as securely as solid bridging?

3. How many rows of fire stops are required in a wall having studs 11 ft. 3 in. long?

Trade: Carpentry — *Unit:* Care and use of tools
Topic: Selection of saws



Stud framing

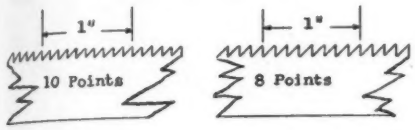
*High School, San Bernardino, Calif.

Objective: To develop the ability to choose the proper saw for any type carpentry job.

Information: Selection of the saw depends on:

1. Degree of accuracy and class of workmanship. For rough lumber, where the condition of the sawed surface is not of great importance, a coarse saw may be used. On the other hand, where fit and appearance are very important, a fine saw must be used. A coarse saw is one with few teeth per inch of length, and a fine saw is one with a larger number of teeth per inch of length.

Saw-blade sections



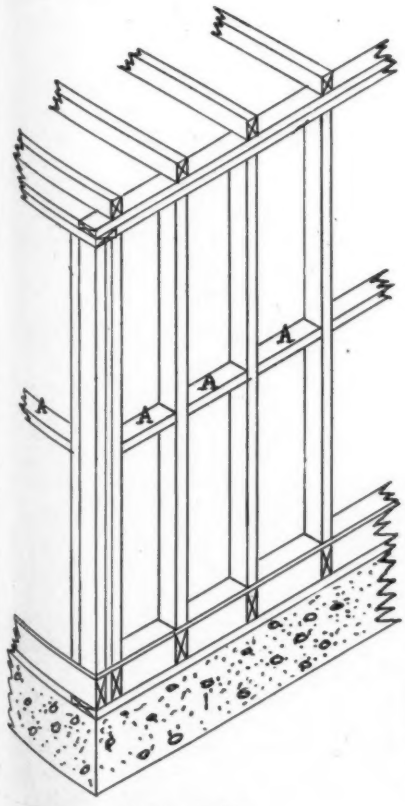
Average practice:

All framing lumber.....7 or 8 point
Douglas fir flooring.....10 point
Interior trim.....12 point

NOTE: The term, 12-point saw, means that there are 12 points to every inch of saw length.

2. Grade and condition of lumber.

In rough lumber such as *common* grades, there is likely to be a great deal of variation in the resistance of the wood to the action of the saw. This is due to knots, moisture, pitch, grain, etc. Therefore a coarse saw should be used.



Wall section

In *clear* lumber, the defects just mentioned do not appear. Therefore, the resistance to the saw is uniform and is much less than in the case of common lumber, permitting the use of a finer saw, which has a thinner blade.

Questions:

1. Which saw would you use for cutting clear siding?
2. Which saw would you use for cutting oak trim?
3. Does a coarse saw cut faster than a fine saw?

Trade: Carpentry — *Unit:* Safety rules and questions

Objective: To develop an appreciation of safety on the job.

Rules and Questions:

1. Never use empty nail kegs for scaffold supports. Why not?
2. If a workman should fall from a scaffold and be severely injured, what should you do? Give reasons for your answer.
3. All injuries, no matter how slight, shall be reported to your instructor immediately. State two reasons for this rule.
4. Puncture wounds are extremely dangerous and should be treated by a doctor. Tetanus is the result of neglected puncture wounds. How should you guard against this type of wound in the carpentry trade?

Trade: Carpentry — *Unit:* Employer-employee relations

Topic: Talk by contractor John Doe

Objective: To develop the knowledge of how to act on the job.

Information: The following questions are based on the talk given before the class by Mr. John Doe. Make your answers clear and to the point.

1. List 5 reasons for discharge from the job.
2. What should you do in the event that you had to be absent from the job?
3. Why will some foremen allow smoking on the job, while others will not?
4. Name 3 acceptable excuses for tardiness.
5. What do you understand by the term industriousness?
6. What is a job politician?
7. Are job politicians popular with employers? Discuss.

Trade: Carpentry — *Unit:* Trade ethics

Topic: Property of others

Objective: To develop the habit of thoughtfulness toward a fellow workman's tools.

Information: In carpentry, as in many other trades, high class working tools are extremely important and usually expensive. Moreover most good workmen acquire a great fondness for certain tools, and therefore it is exceedingly important for one workman to have the proper respect for the tools of another workman. If one man should accidently damage a tool belonging to another man, he should immediately take steps to have the tool repaired or replaced.

Questions:

1. While you are using a 12-point saw that belongs to a fellow workman, you accidentally strike a nail and damage the saw. What is your obligation?
2. Should you fulfill this obligation on the contractor's time? Explain.
3. You loaned a chisel to a fellow workman. He returned it by placing it in your toolbox without your knowing about it. You find the chisel in the proper place, but it has been damaged. What would you do? Discuss.

A VOCATIONAL APPROACH TO EDUCATION FOR DISTRIBUTIVE OCCUPATIONS

MURRAY BANKS*

The introduction of cooperative training in retail selling into the public secondary schools, and the subsequent expansion of this kind of vocational education, represents one of the outstanding attempts to overcome the common criticism that the schools are not giving pupils practical training for retail store employment.

It has been shown by repeated studies that more than half the students who take jobs upon graduation, go into some type of distributive work. It has been recognized, and frequently acknowledged, that one of the most important functions of the school is to prepare the boys and girls "to do better what they will do anyway." Particularly is this an all-important function of the commercial high school which aims to prepare its students for the positions they will hold in business when they leave school.

No school can maintain that it is operating in the best interests of its students and the community if it neglects to contribute in some measure to a more adequate preparation of its students for work that will be available to them and which they will seek. No educator can wisely shut his eyes to the fact that, while the greater proportion of his graduating students who get jobs are getting them in distributive occupations, no effective training in this field is available to the youth of the school.

Distributive education is federally defined as a type of training specifically vocational in nature, centering around skills, knowledges, and attitudes for those occupations which in-

*Co-ordinator of Distributive Education, Battin High School, Elizabeth, N. J.

volve the distribution of goods and services. An employee is regarded as working in a distributive occupation if he is employed in an exchange which performs the functions necessary to distribute goods and services.

The most effective learning and training takes place under a cooperative form or apprenticeship plan whereby the student receives actual practice and experiences on the job, while receiving instruction in school which is directly related to the work being done on the job.

Congress in 1936 passed the George-Deen Act which provided federal funds to encourage communities to introduce a cooperative training program for distributive occupations. These programs are encouraged on the premise that since our prosperity depends not alone upon the manufacture of products, but also on the successful distribution of those products by well-qualified people, it becomes necessary that we study means of developing in our retailing students those qualifications which will make them efficient workers. They will then be prepared to do a job which will benefit the customer, the employer, and themselves.

In introducing a program of vocational distributive education, it should be remembered that mere theoretical knowledge is not sufficient, and that theory and practice must be combined if learning is to be effective. No amount of verbal descriptions, lectures, or textbook readings can take the place of store working experiences, with their accompanying social contacts and the stimulus they offer the student to improve his social abilities.

Only when the pupil has an opportunity for genuine work experience at a wage, supplemented by school instruction directly related to his immediate task, can he be brought face to face with actual business situations and given tools with which to cope with those situations.

Through a cooperative plan, students get an opportunity to apply what they learn to life situations. They have the satisfaction of proving the efficacy of selling procedures and other techniques learned at school. They get the *feel* of working as a part of an intricate machine, the well-organized retail establishment, and when they have completed the course they can more quickly become successful, dependable employees.

When it is possible to secure the cooperation of local merchants, a real tie-up between business life and school can be made, and retail training becomes enriched, more effective, and functional. It is possible when the school supervisors and the employers work in complete understanding and for mutual good, that young *cooperatives* may be started soundly in business at a time when many other young people are looking for a first job. A school system alone, no matter how willing or efficient, cannot accomplish the task. It requires the stanch and close cooperation of the community employers. Any work-study plan or agreement between education and business must be based on business efficiency and mutual understanding.

Specific vocational training is a need of boys and girls which the high schools can and should meet so that youth may be trained to earn a respectable living in addition to living a contented life. Ability to earn a living, however, is prerequisite to living a happy life.

In too many instances the schools have not kept pace with employment opportunities, and have not provided training for the openings which are available to youth in modern business today. It is unfortunate that in most schools the present educational program, especially the commercial program, does not seem to be geared to the demands of business and industry. Too much stress is given in the school to the relative merit of one type of work over that of another. Educators, guidance workers, and parents, are too prone to direct boys and girls into what they deem to be the *better vocations*.

Vocational opportunities in retail selling, merchandising, and the so-called distributive occupations have been overlooked by educators, pupils, and parents. Because office and professional work has for various reasons been rated on a higher plane than store work, parents and families often object to their children's enrolling in a high school retail selling course. This objection is more often an expression of social prejudice than an opinion reached after impartial study of all the factors.

All signs seem to indicate that there exist today more opportunities for initial employment, advancement, and success in the distributive occupations, than in the so-called *office occupations*. Merchandising and store work offer to the graduating boy or girl who are of the right type, and who have been trained in this field, more opportunity to make a place for himself or herself, than does any other of a dozen occupations that one could name.

And what does the cooperating merchant think of the program? Typical of the merchants' reactions to the cooperative plan is that of Ernest B. Lawton, Personnel Director of Macy's, who in speaking for business on the cooperative plan as it operates in New York City, made the following interesting statement:

"Although we have been cooperating with the New York City public school system for over twenty years in the cooperative movement with mutual advantage, it was not until about five years ago that we realized the possibilities in this program.

"The intelligent interest of the school system in business problems which will face young people after graduation has resulted in the development of a practical training program without any sacrifice of academic ideals. The proof of the effectiveness of this program and of the foregoing statement lies in the fact that each year we gladly absorb into full-time jobs a high percentage of the graduating class who have been with us on a part-time cooperative basis. The total group normally numbers approximately 275. Last June out of a graduating class of 97 we placed in regular employment 56.

"As we have developed the apprentice program of anticipating ambitions and developing potentialities, the cooperative program greatly aids us in picking young people whose potentialities will develop along with their years and ambitions so that we avoid having employees come to a stop. By picking young people in the impressionable stage, we are able to establish businesslike habits early.

"No program of this sort could work effectively without sufficient understanding on the part of business and the schools to be willing to continually make the little adjustments that are necessary to make such a program work. Perhaps the greatest advantage of this program if it is carried on graciously by the co-ordinator of the schools is that it offers a check upon business and the proper handling of people. Since the store as well as the school is part of the economic life and social life of the whole community, whatever is right for society should be worked toward as a joint goal by both school and business."

Only through a cooperative program in which local merchants are willing to cooperate by permitting students to work on a part-time basis in the local stores while securing the related instruction in the school, can youth be equipped with the skills and knowledges which will function in a real way on a real job, and which will give the boys and girls an educational experience that could not be matched by formalized classroom instruction alone.

WHY I'M BUYING A BOND

I'm buying a bond from a grand, old concern,
Of which every free man has heard;
A gilt-edged investment with splendid return,
And a bonus of — U. S. preferred;
And with it I'm buying a share of the thing
That I'm fearful will vanish away —
The birthright of freedom, to which I must cling —
So I'm buying a bond — today.

I'm making a purchase that you will admit,
Is a token of faith — *yours* and *mine*;
Of value, exceeding the trifling bit
That's noted in graven design;
And high above par in honor and pride,
With the backing of all that is dear;
And a tower of strength — should the despot decide
To prove that it — can happen here!

I'm buying a bond — perhaps two or three,
Or more, for the moment is grave;
Yet, I'd much rather a thousand times be
My own man, though poor — than a slave;
I want to hold fast to my cherished ideals
And all of which I am fond,
With courage to face what the morrow reveals —
That's why — I'm buying a bond!

— Courtesy, Adam N. Reiter, West Chester, Pa.

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION
John J. Metz, Editor

How About That Scrap?

IT IS a well-known fact that the United States depends very much on scrap of all kinds for producing the munitions of war which are now so greatly needed. Probably if we all begin to realize that if America fails the entire world fails, we will begin to respect the potentialities that lie in the salvaging of even modest amounts of scrap.

Probably the school shop is not a source from which a great deal of scrap might be expected. However, there are schools that could produce several hundred pounds of valuable cast iron and steel scrap without much trouble. There are dark nooks in many school basements that harbor old automobile engines and parts which have not been used for several years and will most likely never be used again. Why not cart them out for real wartime duty?

Then there are old broken tools which have been stored away for future use. These, too, are valuable right now when contributed to the scrap drive which must be carried on relentlessly if this country is to arm itself and the Allied Nations to defeat the common enemy.

Another source of valuable scrap are the odds and ends of copper wire of various sizes that accumulate year after year in our electrical classes. This material is almost pure copper and is very valuable because the supply of this type of salvage material is very low and is in great demand. A recent release stated that the United States depended upon scrap as the source of approximately 40 per cent of its copper. This release also stated that only one fifth of the copper scrap refining capacity is now operating, which means that the supply is very low. The 1943 scrap demand is much greater than it was last year. Even a small amount of salvaged copper deserves our consideration.

The school shop itself ought to have a very careful salvage program. The amount of nails, screws, screw eyes, nuts and bolts, and even tools that are carried out of the school shops with the shavings and sweepings each year, no doubt, run to sizable quantities. It would be an easy matter to salvage most of these with an old magneto magnet, or an electric magnet that could be made by the students of electricity. It would pay to do this, because nails and screws, and nuts and bolts are growing very scarce. But even if this were not important, the habit of thrift which would be inculcated in the students would be more than worth while.

So much for the scrap drive in the school shop. How about enlisting the younger shop students in making a strenuous effort to do a patriotic thing by collecting waste whenever and wherever possible during the summer vacation. There are many communities that have amassed real wealth in their city dumps during a span of years. There are old abandoned barns and shops and hovels, the owners of which could possibly be persuaded to allow the youngsters to engage in a real treasure hunt, salvaging usable metal which is now serving no useful purpose, and which in the course of a year or two will be but a victim of the elements.

Make the students salvage conscious, help them plan their campaign, show them how patriotic their work will be, and see what they can accomplish. While the boys are collecting the needed metal scrap, don't forget to remind them that animal and vegetable oils and fats are extremely useful in producing glycerine for explosives. Their sharp eyes and ingenuity may probably do much in changing the statement, "The quantity of salvage collected is decreasing lamentably."

Vacation Days and the Student

UNDER this same heading, shop teachers were urged in the last issue to do their utmost in preconditioning their students against the many dangers which lurk on streets and highways, on ponds, rivers, and lakes; and in the handling of campfires, contacts with electric wires, and other circumstances harboring hidden dangers.

There is need also that the few remaining weeks of school be devoted to giving the child a better understanding of the social relationships which will affect him as a member of a group. This year children will be less supervised than ever before. There will be less home supervision in numerous families, and playgrounds will most likely not have the experienced supervisors to whom communities were accustomed in the past.

The children must, therefore, be charged with the responsibility of carefully regulating their own natural impulses. More than ever before, they have to be cautioned to observe the rules of fair play — to think of others as well as of themselves, to practice unselfishness, and to protect weak and younger children.

They also must be given an understanding of the necessity of using public playground facilities with the greatest care. They must feel that it is their responsibility to return every bit of equipment after having used it.

They also must recognize that when away from the playground, public and private property is to be respected to the fullest extent. Naturally, children will do thoughtless things, but if they feel that the responsibilities of adulthood are being transferred to them, and if they are made to see that it is patriotic to observe the rules of the playground even when, because of the war, there will be little or no supervision, many young Americans will respond in the proper way.

This summer will be a test of what children have actually acquired in the way of social training. The situations under which the children will find themselves will be real life experiences. Their reactions to these experiences, however, will not only be a test of the children, but they will also show how we, the teachers of these children, have influenced and molded their youthful characters.

Are You Changing Your Address?

WITH paper restrictions, reduced transportation, and slower mail service, there is a greater need than ever before for the subscriber to make sure that he gets every copy of the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine to which he is entitled.

If changes of addresses are not sent to our circulation department, many copies of the magazine will be lost, and many will not be replaceable. The time for generously figured press runs is over for the duration.

The readers, therefore, are asked to attend to this matter promptly. The note on page 15A of this issue gives explicit directions for properly notifying our circulation department.

New Priority Rating for Schools

SCHOOLS and colleges may now use a blanket priority rating of AA-2X for maintenance, repair, and operating supplies, and for minor items of capital equipment, where such items cost less than $100.

Copies of CMP Reg. 5A explaining this regulation may be obtained from the nearest Priorities Field Service Office.

All educational institutions should maintain periodic contact with their nearest office, since the regulations and amendments issued by the War Production Board are altered as changing situations demand.

Annual Boat Regatta

O. B. BADGER*

In 1927, the industrial-arts department of the Portland public schools, Portland, Ore., in cooperation with the Journal Juniors (a youth organization sponsored by the *Oregon Journal,* a daily cosmopolitan newspaper), conducted a model boat regatta which created so much enthusiasm and interest that it has become an annual event.

Every boy in Portland looks forward to the time when he becomes a seventh grader, because during the spring term, model-boat building is part of the regular course of study in industrial arts for the seventh-grade boys.

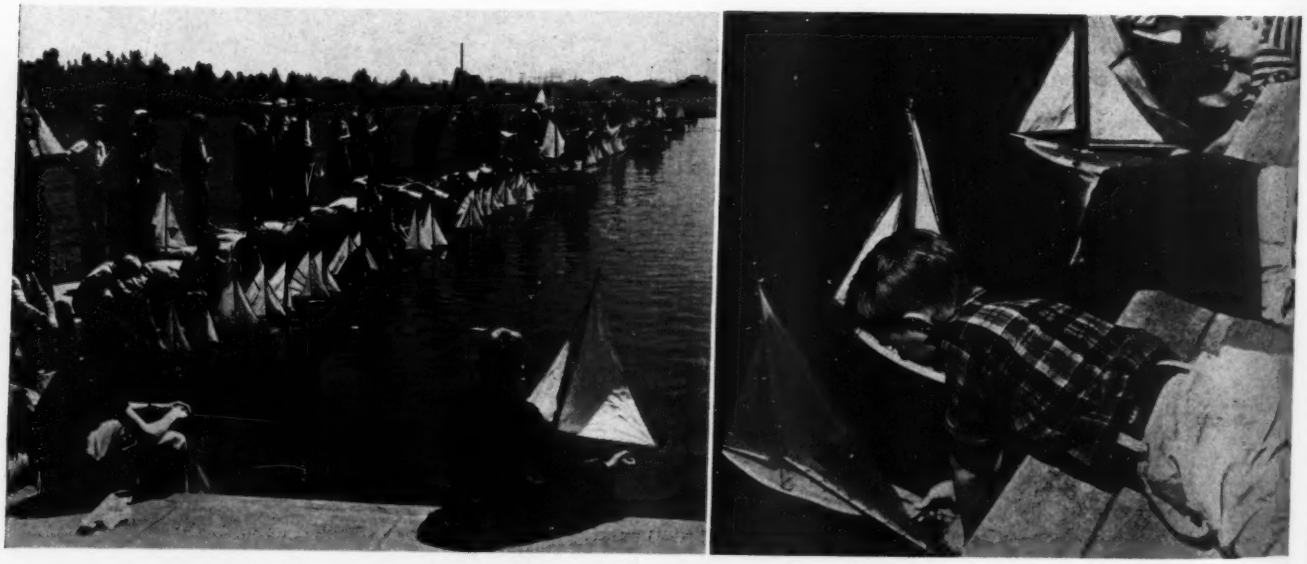
At the close of the school year, the model boat regatta is held at Westmoreland Pool, a large pool that was constructed by the city as a wading pool for children, a casting practice place for fishermen, and for use by the schools in giving the boat regattas.

Hundreds of boats of all kinds, size, and construction are entered. They are grouped into the following classifications — those under 18 in., 18 to 24 in., 24 to 36 in., and those over 36 in. in length. These dimensions apply to both sailing and motor boats.

School and city officials and prominent citizens, interested in youth and education, act as honorary commodores and judges for the events that are witnessed by hundreds of interested parents, friends, and marine enthusiasts. A local radio station broadcasts the races, event by event, and announces the winners who receive medals and prizes awarded by *The Oregon Journal.*

Being water minded, Portland people respond most enthusiastically to this major event of the school year. The boat building program stimulates an interest in school activities that is of tremendous value in bringing the school and the community into closer contact. What is more, the annual regatta makes chums of fathers and sons.

Lieutenant Commander G. F. De Grave, one of the judges checking motor boats for workmanship



Contestants lined up ready for the starting of a race, and boys adjusting their boats for the race.
Westmoreland Pool, Portland, Oregon

*Assistant Superintendent, Public Schools, Portland, Ore.

A LESSON PLAN

LIEUT. COMDR. EDWARD B. FLAHERTY*

Typical Lesson Plan

Name: ..... *Trade:* Electrician
Lesson: To solder a piece of 16,500 circular mils wire to a lug.
Type of lesson: Shop

This lesson is to be taught to a group of eight pupils. The pupils have the following experience:

One month *experience.* They have a knowledge of how to skin a wire, to find the size of wires, to solder a joint, and to tape a joint.

Materials, tools, and equipment required:

One 6-in. side cutting pliers; an electrician's knife; a box of matches; a blowtorch; a can of soldering paste; some 50-50 solder; and some friction tape.

Preparation

Lesson: To solder a piece of 16,500 circular mils wire to a lug

Line of approach	*The developmental method*
By the use of some suggestive questioning it is proposed to develop the following ideas as the necessary preparation to teach the lesson.	The ideas are brought out by the following developmental questions. Statements are only expressed for the purpose of clarifying the ideas, or perhaps when it is difficult to get response from the group. Questions are more stimulating than statements.
1. Why use a lug.	1. *Question:* Besides making wire loops under binding posts, what other method can be used to connect wire? — *Edward.* *Answer:* An electrical lug.
2. Advantages of using a lug.	2. *Question:* Can you tell me why lugs are preferable to use in certain kinds of work? — *Tim.* *Answer:* Heavy wires are difficult to hold under small binding posts, and the National Electrical Code condemns this practice when the wires are larger than 16,500 circular mils wire. The lugs are generally more secure and make a neater job. This question also could be phrased so as to cover the foregoing answer.
3. A size wire should have a corresponding size lug.	3. *Question:* Is there any rule fixing the size of wire to be used with a given lug? — *George.* *Answer:* I don't know. *Statement:* A certain size wire should have a corresponding size lug.
4. Method of fastening wire to lug.	4. *Question:* What will hold the wire (hold wire in left hand, and lug in the right hand) to this lug? — *Sam.* *Answer:* Squeeze the lug to the wire. *Question:* But the wire could be marred by doing this. (Demonstrate, and look at Sam.) *Some other pupil may answer:* Solder the wire to the lug.
5. A good electrical contact.	5. *Question:* Why is the lug soldered to the wire? — *Dan.* *Answer:* To make it electrically secure.

Point of departure. Now, I shall show you how to solder the piece of 16,500 circular mils wire to this lug.

Presentation Methods

A lesson is presented by the following two methods.

I. *The developmental method.*

a) *Conducting an experiment* in front of the pupils. I shall try to ask them suggestive questions, so as to make them follow my steps and stimulate their thinking.

b) *Conducting a demonstration.* By this I mean that I will show them how the job is done. While I am performing this demonstration, I shall ask developmental questions, and also may call on the pupils to participate in the demonstration. At times I may be compelled to make a few statements to clear some ideas. If I notice that a pupil did not really understand me, I shall endeavor to reframe my question, or make another further statement.

c) *By the use of illustration.* This kind of lesson is of a technical nature. This may be related work, or it may be a condition where it is preferable to explain the lesson on the blackboard, such as the stretch out of a cone.

A practical teacher makes use of (*a*), (*b*), or (*c*), or their combination to suit the existing teaching conditions.

II. *The information method.*

a) Explaining while demonstrating how a thing is done. Here the teacher does not ask questions. This is not to be recommended, as this form is poor teaching.

b) Illustrating and telling while drawing on a blackboard as how a job is done, or the solution of a related lesson.

c) Lecturing to the group as how a job is done, or the solution of a related lesson. This method should not be practiced by shop instructors.

Presentation

Lesson: To solder a piece of 16,500 circular wire (mils) to a lug

Line of approach	*Demonstration — Developmental questions*
The lesson is taught by the following suggestive questions to cover the new teaching points.	The substance of this new lesson is expressed by the reaction of the questions, or some statements that give a better understanding of the lesson. Meanwhile, the teacher will demonstrate, illustrate, experiment, or tell how the job should be done, or as how the related knowledge should be taught.
1. The amount of insulation to skin from one end of the wire.	1a. *Question:* Roughly speaking, how deep is this lug? — *John.* *Answer:* 5/8 in. 1b. *Question:* How much insulation would you skin off? — *Peter.* *Answer:* 5/8 in.

*Tacoma, Wash.

Line of approach	*The developmental method*
	1c. *Question:* What happens when the rubber gets in the way of the flame? — *Roy.* *Answer:* The rubber burns. 1d. Then how much exposed part would you allow from the lug end? — *Pat.* *Answer:* About ¼ in.
2. Tinning wire.	2. *Question:* Why is the end of the wire tinned? — *Jim.* *Answer:* To make sure that the solder sticks to the wire.
3. Tinning lug.	3. *Question:* Why is the lug tinned before the wire is put in its end? — *Bob.* *Answer:* To make sure that the inside of lug is clean and also to fill lug with solder.
4. Sweating wire to lug.	4a. *Question:* What is to be done now? As you see, the wire cannot go through the solder. — *Bert.* *Answer:* I don't know what to do. 4b. *Question:* Suppose we apply heat to the body of the lug. Tell me then how could the wire go through? — *Dick.* *Answer:* The solder melts, then the wire is pushed in.
5. Amount of heat required to sweat wire to lug.	5. *Question:* When should I remove the heat from the body of lug? — *Tom.* *Answer:* As soon as the solder melts. *Statement:* Remove the heat, then hold the wire and lug rigidly till the solder cools down.
6. Tape around exposed end of wire.	6. *Question:* Why is it a good sign of workmanship to take the end of the exposed wire? — *Frank.* *Answer:* It looks neater, and in a crowded place where there are many wires it prevents short circuits.

Trade Instructors' Training Course

Name ..... Shop ..... Check No. .....

A Lesson Plan

Lesson — To solder a piece of 16,500 circular mil wire to a lug.

Application

Method of Approach. The developmental method.

Reasons for Method Selected. Because by asking the pupils suggestive questions, I may be able to stimulate their thinking to instill in them the principle of initiativeness; and by so doing, they could correct any errors involved.

Procedure

a) Each pupil is given a length of 16,500 circular mil wire and a lug.

b) I will assist the pupils by asking suggestive questions so that the new ideas of the presentation could be followed.

c) At times I find it necessary to actually perform part of the job, to make sure that the right technique is carried out.

The following are some of the points that require attention:

1. *Question.* The solder doesn't seem to stick in your lug, John. Why?

Answer. I don't know.

2. *Question.* What do you say, Harry?

Answer. John forgot to put paste in the lug.

3. *Question.* Why is Ted having trouble in making the end of the wire go through the solder, George?

Answer. He should apply more heat to the lug.

4. *Question.* You have the insulation of the wire in the solder. I want you to take the wire off and skin more of that insulation. Do you know why you have to do this, Tom?

Answer. Yes, to make sure of proper contact with the lug.

5. *Question from pupil.* My wire is loose. Can you help me, Sir?

Answer. Certainly, Pat. With your right hand hold the lug close to the flame, and hold the wire in your left hand. You see now that the solder is liquified. Steadily, and without moving your hands, move away from the flame. After a short while, the solder solidifies.

6. *Question.* You have too much copper showing. What caused this, Peter?

Answer. I took too much insulation off the wire.

7. *Question.* How much friction tape should you put around the end of the wire, Charles?

Demonstrating. See, this is the way to do it, Charles.

Test Methods

A. Kind of tests

1. Test on the job
2. Written test
3. Oral test
4. Illustrative test

B. 1. The direct test on the job is the best for trade work.

2. The written test is conducted for related technical knowledge and is generally carried out in the classrooms. This sort of test could be used to cover a great field of trade instruction.

3. The oral or recitation test is employed to expedite the course of instruction in the classroom. This should not be preferred to the test on the job.

4. The illustrative test is convenient when describing a complicated trade process or machinery. It could be used in conjunction with either (2) or (3).

Test

Best Method. Testing on the job

Reasons for Method Selected

I feel confident that the pupils could do the job unassisted, and that the job will prove satisfactory. I base my supposition on the following factors:

a) That the pupils have participated in the demonstration, and therefore know how to do the job.

b) Through the developmental suggestive questions, and the answers given in the application step, reactions show that all mistakes could be eliminated.

c) That under my guidance, the pupils have actually done a job of a similar type in the previous step of the lesson (the application step).

Procedure

At a later date the pupils are given a job of a similar nature, but one that has more operations and requires a greater degree of skill.

Proposed job test: To solder a stranded 28,250 circular mil copper wire to a lug.

Points that I will check up are:

1) Method of tinning lug.
2) Amount of insulation to be taken from end of wire.
3) Thoroughly cleaning insulation from strands.
4) Contact strength.
5) Taping exposed copper.

Educational Values and Social Habits Obtained from High School Mechanical Drawing

B. ALFRED COX*

Instructors of high school mechanical drawing frequently have been asked to justify the teaching of their subject. Such questions as these arise. Why teach mechanical drawing in high school? What educational values may be secured from the subject? Are there any social habits obtained from a study of the subject? Are there any learning principles that can be carried over to other high school subjects? What can the high school pupil obtain from this subject that might be carried over into his vocational interest? Is it true that many pupils who study the fundamental principles of drafting will never have any use for them? Is time being wasted having pupils study mechanical drawing in high schools? These and similar questions have been asked the drafting teacher many times.

The high school mechanical drawing teacher uses many different methods of teaching this subject. In doing so, he has proved the value of his subject and has thus answered many of the foregoing questions. However, even today drafting teachers are still confronted with a few doubtful administrators. Any new method of teaching this subject that might help to convince the doubtful administrator of its value in the school curriculum should be published. Then again, if the drafting teacher can show any increased educational values or social habits that might be derived from the subject to help pupils, he ought to let others know about it.

Since it is usually an elective subject, a drafting teacher will find assigned to his class, pupils from grades IX through XII. These pupils will have thoughts ranging from those of the first term to those of the last term. It then becomes the duty of the drafting teacher to make his work interesting and show its importance to the freshman as well as the senior. To include such questions as those mentioned in the opening paragraph will aid in helping the instructor to reach his objective. It is generally agreed that in teaching such a subject constructively, much depends upon getting off to a good start. One finds it quite pleasant, teaching a subject if the pupils understand the objectives of the work. Therefore, a system must be developed to secure the interest of the pupils from the very beginning. Each pupil must be given some help in order to succeed in his work. In a majority of cases, it is not only the subject matter, the activity, nor the amount of either which he retains, but rather the influence which the subject has on the pupil's personality, character, disposition, integrity, ability, faith, and perseverance to adapt himself to different conditions, and his estimation of himself that are far reaching.

This article includes nineteen general high school subjects or fields and are as follows:

General High School Subjects or Fields

1. Art
2. Business
3. Chemistry
4. Civics
5. Economics
6. English
7. Geography
8. Government
9. Gym
10. Health
11. History
12. Home Economics
13. Industrial Arts
14. Languages
15. Mathematics
16. Music
17. Physics
18. Science
19. Sociology

At the beginning of each term time should be allowed to obtain a list of the class's various subjects and their vocational interests. It might be rather early for some of the pupils to make definite decisions of their life's work. However, it would be a good time to have all pupils think seriously about this matter. After accumulating such a list the class is ready for a short analysis of the selected vocations. At this point the drafting teacher has the opportunity of showing the pupil what part mechanical drawing will play in his chosen vocation. He also can show him what can be obtained from the subject as a carry-over, both in other high school subjects (that he is taking at the time) and his selected vocation. Here are listed eighty-six vocational interests accumulated over a period of time that pupils gave as their various life interests.

Eighty-Six Vocational Interests Selected by High School Pupils

1. Actor
2. Airplane mechanic
3. Architect
4. Artist
5. Army officer
6. Athletic director
7. Auto mechanic
8. Aviator

* = Very High X = High O = Medium High School Subjects	Social Habits: Appearance	Appreciation	Cheerfulness	Cleanliness	Cooperation	Consideration	Courtesy	Disposition	Ethics	Faithfulness	Honesty	Kindness	Loyalty	Neatness	Obedience	Patience	Personality	Punctuality	Respect	Sympathy	Tact
Art	*	*	X	*	*	X	X	X	X	*	X	X	X	*	*	X	*	*	X	X	X
Business	X	X	*	*	*	*	*	*	X	X	*	*	X	*	*	X	*	*	X	X	*
Chemistry	X	X	X	*	X	*	*	X	X	*	X	X	*	*	X	*	X	*	X	O	X
Civics	O	O	X	X	*	*	*	X	X	X	*	X	*	X	*	*	X	*	*	*	X
Economics	O	O	X	X	*	*	X	X	X	*	*	X	X	X	X	X	X	*	X	X	*
English	*	X	X	*	X	X	X	X	X	X	X	X	X	X	*	X	*	X	*	X	X
Geography	X	*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Government	X	X	X	X	*	X	X	X	*	X	X	*	X	X	X	X	*	*	X	*	*
Gym	X	X	X	X	*	X	X	X	X	X	X	X	X	X	X	X	X	*	X	X	X
Health	*	X	X	*	X	X	X	X	X	X	X	X	X	X	X	X	X	*	X	X	X
History	X	X	O	X	X	O	O	O	X	X	X	X	*	*	X	X	X	*	X	X	X
Home Economics	*	X	X	*	X	X	X	X	X	X	X	X	X	X	*	X	X	*	X	X	X
Industrial Arts	*	*	X	*	*	X	X	X	*	*	*	*	*	*	*	X	*	*	*	X	X
Languages	X	X	X	X	X	X	X	X	X	X	X	X	X	X	*	X	X	*	X	X	X
Mathematics	*	X	X	*	X	X	X	X	X	*	X	X	*	*	*	X	*	*	X	X	X
Music	*	*	X	X	*	X	X	X	X	*	X	X	*	*	*	*	*	*	X	*	*
Physics	*	X	X	*	X	*	*	*	X	*	X	X	*	*	*	X	*	*	X	X	*
Science (Gen.)	*	X	X	*	X	X	X	X	X	*	X	X	*	*	*	X	*	*	X	X	X
Sociology	X	X	X	X	*	*	X	X	X	*	*	X	*	X	X	X	X	*	X	X	*

Table I. Relation of high school subjects to social habits obtained from mechanical drawing

High School Subjects	Educational Values: Accuracy	Alertness	Ambition	Careful Observation	Character	Concentration	Confidence	Control of Ideas	Coord. bet. Hand and Eye	Courage	Definiteness	Dependability	Determination	Economize	Efficiency	Effort	Encouragement	Enthusiasm	Estimate	Evaluate	Force	Follow Directions	Individualization	Industry	Interest	Initiative	Keen Visualization	Legibility	Motivation	Perseverance	Reliability	Responsibility	Speed	Stimulation	Success	System	Take Orders	Think	Thrift	Withstand Criticism
Art	X	X	X	*	X	*	*	*	*	X	*	X	*	X	X	*	*	*	X	X	*	X	*	X	X	*	*	X	X	*	X	X	X	*	X	X	*	X
Business	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	X	X	X	*	*	X	*	*	X	*	*	X	X	X	*	X	*	*	*	*	*	*	*
Chemistry	*	X	X	*	X	*	*	*	*	*	*	*	*	X	*	X	X	X	*	*	X	*	*	X	*	*	X	*	*	*	X	*	*	*	*	*	X	*
Civics	O	O	O	X	X	X	*	*	O	X	*	X	*	X	X	X	X	X	X	*	X	X	X	*	X	X	X	*	X	X	*	X	X	*	X	X	*	X
Economics	X	X	X	X	*	*	*	*	O	*	*	*	*	*	X	*	*	*	*	*	X	X	X	X	*	*	*	*	X	X	X	X	X	X	X	X	*	X
English	X	X	X	*	X	*	X	*	O	*	O	O	O	X	O	O	X	O	X	*	*	X	X	X	*	*	X	*	X	X	*	O	X	X	X	X	O	X
Geography	*	X	O	*	O	*	X	X	O	*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	*	X	X	X	X	X	O	O	X	X	X	O	X	O
Government	*	*	X	*	*	X	*	*	*	*	*	*	*	*	*	*	X	X	X	*	X	*	*	X	X	X	*	X	X	*	*	X	*	*	X	X	*	X
Gym	O	X	O	*	X	X	O	X	*	*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	*	X	X	X	*	X	X	X	X	X	*	X
Health	X	X	O	*	X	X	X	O	O	O	O	X	O	X	O	O	O	O	*	X	X	X	X	O	O	*	X	X	X	*	O	Y	X	X	O	Y	*	O
History	*	X	O	*	O	X	J	*	O	O	X	*	O	O	X	X	O	O	O	X	O	O	X	X	*	X	X	X	X	X	O	O	X	O	O	*	*	X
Home Economics	X	X	O	*	X	X	*	*	*	X	*	X	O	*	X	X	O	O	X	*	X	*	*	X	X	*	*	Y	X	*	O	O	*	O	*	*	*	X
Industrial Arts	*	*	X	*	*	*	*	*	*	*	X	*	*	*	*	*	*	*	X	*	*	X	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Languages	*	X	O	*	X	*	X	X	O	X	*	X	X	O	O	X	X	O	*	X	*	X	*	X	X	O	X	X	O	G	O	O	*	O	X	O	*	X
Mathematics	*	*	X	*	O	*	X	X	*	X	*	X	X	X	X	*	X	X	X	*	X	*	X	*	X	X	*	X	*	X	*	X	*	*	*	*	*	X
Music	*	*	X	*	*	*	*	*	*	*	*	*	X	*	*	*	*	*	X	X	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Physics	*	*	X	*	X	*	*	*	*	*	X	*	O	X	*	*	X	X	*	*	X	*	*	*	*	*	*	X	X	*	X	*	*	*	*	*	*	*
Science (Gen.)	X	X	O	*	O	*	X	*	O	*	X	X	X	O	*	X	X	X	*	*	X	*	*	*	X	*	*	X	X	*	X	*	*	*	*	*	X	*
Sociology	X	X	O	*	X	*	X	*	O	X	*	X	O	O	O	X	O	O	*	X	X	X	X	X	X	X	*	X	X	*	X	*	*	*	*	*	*	X

Table II. Relation of high school subjects to educational values obtained from mechanical drawing

*Vernon High School, St. Louis, Mo.

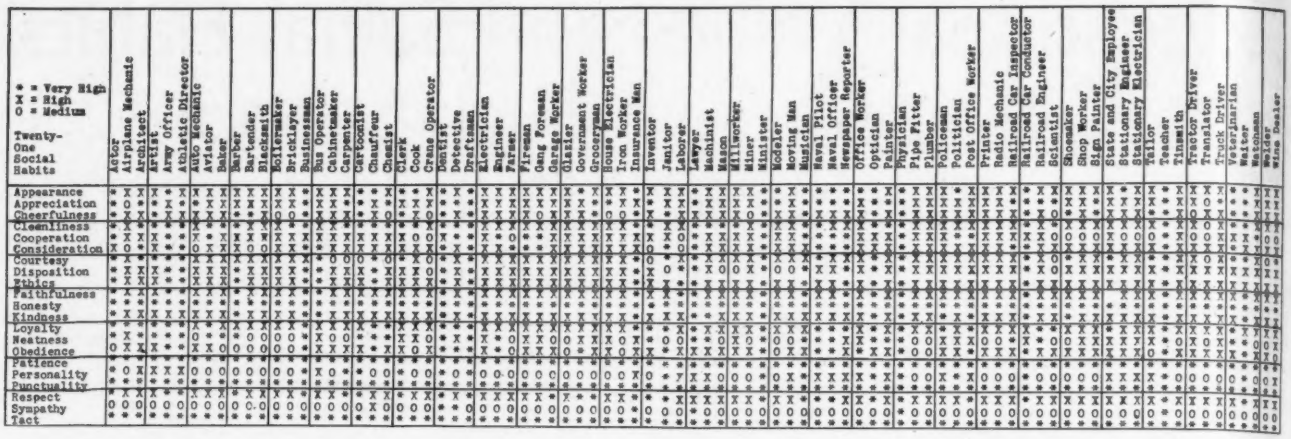


Table III. Relation of social habits to the high school pupil's vocational interests obtained from mechanical drawing

9. Baker
10. Barber
11. Bartender
12. Blacksmith
13. Boilermaker
14. Bricklayer
15. Businessman
16. Bus operator
17. Cabinetmaker
18. Carpenter
19. Cartoonist
20. Chauffeur
21. Chemist
22. Clerk
23. Cook
24. Crane operator
25. Dentist
26. Detective
27. Draftsman
28. Electrician
29. Engineer
30. Farmer
31. Fireman
32. Gang foreman
33. Garage worker
34. Glazier
35. Government worker
36. Groceryman
37. House electrician
38. Ironworker
39. Insurance work
40. Inventor
41. Janitor
42. Laborer
43. Lawyer
44. Machinist
45. Mason
46. Millworker
47. Miner
48. Minister
49. Modeler
50. Mover
51. Musician
52. Naval pilot
53. Naval officer
54. Newspaper reporter
55. Office worker
56. Optician
57. Painter
58. Physician
59. Pipe fitter
60. Plumber
61. Policeman
62. Politician
63. Post-office worker
64. Printer
65. Radio mechanic
66. Railroad car inspector
67. Railroad car conductor
68. Railroad engineer
69. Scientist
70. Shoemaker
71. Shopworker
72. Sign painter
73. State and city employee
74. Stationary engineer
75. Stationary electrician
76. Tailor
77. Teacher
78. Tinsmith
79. Tractor driver
80. Translator
81. Truck driver
82. Veterinarian
83. Waiter
84. Watchman
85. Welder
86. Wine dealer

After a short analysis of the various vocations, a list of social habits can be set up. When a creditable list has been gathered the class should be allowed to discuss them in relation to the list of vocations. Such social habits as carefulness, cheerfulness, cleanliness, obedience, courtesy, etc., may well be used to fill a recitation period.

Twenty-One Social Habits

1. Appearance
2. Appreciation
3. Cheerfulness
4. Cleanliness
5. Cooperation
6. Consideration
7. Courtesy
8. Disposition
9. Ethics
10. Faithfulness
11. Honesty
12. Kindness
13. Loyalty
14. Neatness
15. Obedience
16. Patience
17. Personality
18. Punctuality
19. Respect
20. Sympathy
21. Tact

A final list of educational values can be secured and studied in relation to their carry-

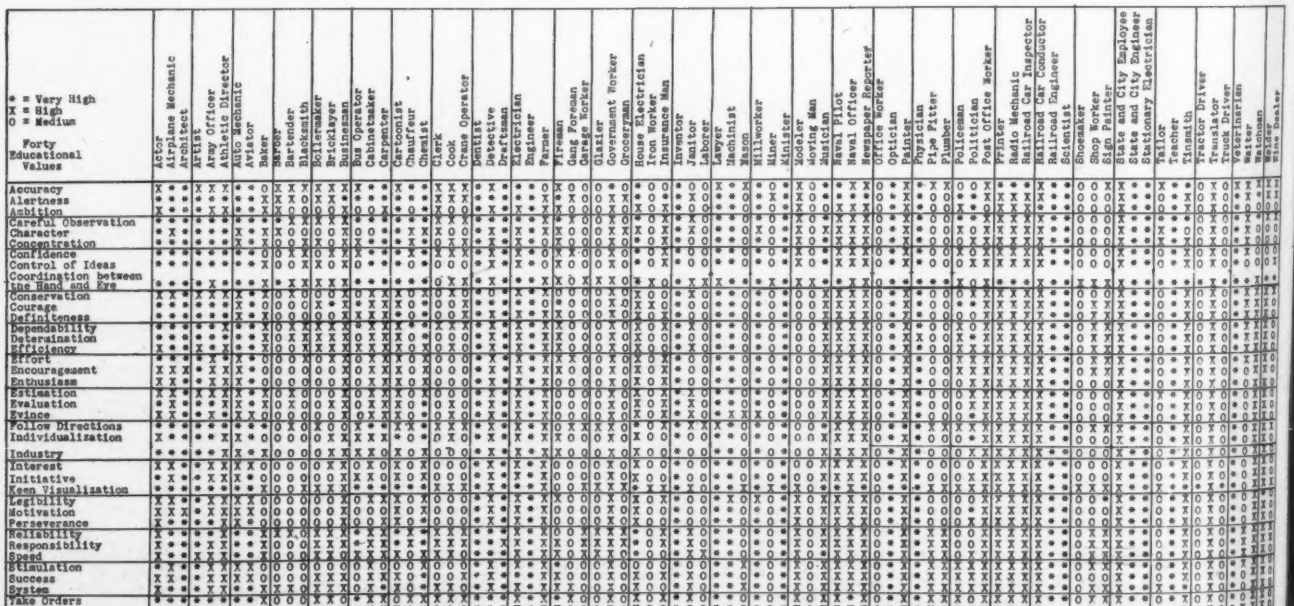


Table IV. Eighty-six indicated vocational interests and their relation to educational values inherent in mechanical drawing

over in other high school subjects and the various life's vocations. It is a known fact that one of the most important educational values obtained from mechanical drawing is good workmanship. This particular educational value that is exercised in mechanical drawing is a valuable aid to any vocation. There isn't anything more harmful to a pupil than permitting him to develop a *get-by* attitude. The get-by attitude is discouraged in mechanical drawing, for the highest quality of work is the goal. Quality in education and in life is one of our most vital needs. The habit of doing work well makes for individual happiness.

The following list contains forty educational values which may well be studied by pupils in mechanical-drawing classes.

Forty Educational Values

1. Accuracy
2. Alertness
3. Ambition
4. Careful observation
5. Character
6. Concentration
7. Confidence
8. Control of Ideas
9. Co-ordination between the hand and eye
10. Conservation
11. Courage
12. Definiteness
13. Dependability
14. Determination
15. Efficiency
16. Effort
17. Encouragement
18. Enthusiasm
19. Estimate
20. Evaluate
21. Evince
22. Follow directions
23. Individualization
24. Industry
25. Interest
26. Initiative
27. Keen visualization
28. Legibility
29. Motivation
30. Perseverance
31. Reliability
32. Responsibility
33. Speed
34. Stimulation
35. Success
36. System
37. Take criticism
38. Take orders
39. Think
40. Thrift

High school drafting is a valuable subject in the curriculum. The values derived from it will prove beneficial to any pupil in or out of school. Pupils studying this subject learn appreciation of good work. They learn how to be alert and look for the worth while, which is a good educational aid in any vocation or high school subject. The pupil will receive as many educational values and social habits from this subject as can be obtained from almost any other high school subject. The charts shown in Tables I and II will indicate how the principles received from the subject carry over in other high school subjects and life vocations. One should not expect a pupil, on studying a year of drafting, to become a draftsman any more than a year's study in history would make him an historian, or a year's study in mathematics would make him a mathematician. If the subjects taught in high school are to aid in giving life experiences to the student, then mechanical drawing may well be classified as an A1 high school subject. Tables III and IV show the relationship of social habits and educational values to the selected vocational interests. The importance of various social habits and educational values are represented by three marks. *Very high* relationship is indicated by an asterisk (*). The *high* relationships by an X, and *medium* value by an O.

Ship-Fitter Course Trains Workers for the Shipbuilding Industry

LAURENCE W. ROSS*

Since the fall of 1941 the wartime vocational education program for adults in Greenville, S. C., has conducted classes for the training of helpers and apprentices to ship fitters, welders, sheet-metal workers, and loftsmen in southeastern Navy and private shipbuilding yards. Originally designed to provide a minimum of training for prospective helpers to ship fitters and welders in the Charleston Navy Yard, the Greenville classes were offered at both the Greenville High School and the Parker District High School. A trainee, after receiving a minimum of 180 hours of balanced instruction is certified for immediate entrance upon employment at the Navy Yard in Charleston, S. C., though it is not mandatory that he or she go to that particular yard. A number of certified men and women have gone to private shipyards, which are also eager to secure workers who have had this preliminary training.

Description of the Course for Helper Ship Fitters

The helper ship-fitter course offered at the Greenville schools is both informational and practical, despite the fact that Greenville is well inland. Instruction includes the following balanced program of studies:

Safety rules and regulations (as at Charleston Navy Yard); nomenclature (trade terminology); abbreviations and symbols; materials; welding; sheet-metal layout; blueprint reading; order of assembly; shop organization; and yard rules and regulations.

While this list is given in somewhat the order of the chronological presentation, it must be borne in mind that some of these parts of the course are the subject for continuous study at all levels of training. For example, the study of nomenclature and abbreviations takes up a small part of each day's work, because trainees tire quickly of this bookwork; hence, essential though it may be, it is given in small doses.

The welding equipment is too scarce for each trainee to have a torch for his or her personal use at all times; hence, more time is spent in blueprint reading and sheet-metal layout than in any other single department.

Safety Rules and Regulations

Because of their applicability to every shipbuilding yard, whether under Naval or of private ownership, the first requisite in the Greenville course for ship fitters is the general mastery of safety rules and regulations for a Navy Yard. The manual of rules published by the Charleston Navy Yard is used. This material is given first because (1) the study of the manual gives an early index to the literacy, and consequently the degree of help

A corner of the blueprint and drafting room

*Senior High School, Greenville, S. C.

that will be required, in the case of each newly enrolled trainee; (2) a written test on these rules is generally required of each applicant at the Navy Yard, where most of the Greenville trainees eventually go to work.

The trainee first studies the general rules, applicable for all departments of the yard. Then rules are given for special work, such as: locomotives, cranes, and hoists; gas cylinders and welding equipment; hand tools and their use; emery wheels; and portable electric tools. After a few hours' study of all the rules the trainee is given a test on the material studied. Samples of questions each student must answer are:

Where should tools be kept? When is it permissible to ride a crane? What should you do if you find loose or hanging wires? Why not put oily rags in lockers? Why not use celluloid eyeshields? Why not test oxygen cylinders with compressed air? Why not use a hardened hammer on hard steel? How should adjustable wrenches be used?

Occasionally motion pictures dealing with factory safety and first aid are shown to the classes.

Nomenclature (Trade Terminology)

In order to learn the nomenclature necessary for the new helper ship fitter, the trainees usually are required to study this material faithfully for an hour or two each day over a period of several weeks. For the average trainee, one or two hours of any type of work is about as much as he can conveniently take. It must also be remembered that most of the trainees are taking the course after working a full shift at their daily jobs. For this reason the work must be given with a sympathetic understanding by the instructor. To make the work more palatable, the instructor should suggest readings, make explanations, draw attention to illustrations and diagrams, and ask questions regarding what has been read. Frequently the lecture method is employed in this study.

From time to time trainees are encouraged to construct various models such as: a hull of a tanker; a destroyer; a cross section of a cargo ship; a skeleton of a cargo ship showing the frames and bulkheads; buttock-line charts, etc. These models which are usually built as group projects are in turn used by the instructor for illustration and for purposes of asking questions about ship construction. In this manner the poor readers, or trainees, with little school background are kept from being penalized, since much of the study of nomenclature thus becomes equally accessible to them.

One of the most difficult and taxing obligations of the instructor in ship fitting is this very job of teaching nomenclature. Here more than at any other part of the course a variety of teaching methods appeals to imagination, and all sorts of motivating devices must be brought into play. Visual education through motion pictures helps a great deal, but the teacher must at all times be sensitive to the interests of the group, lest waning interest lead quickly to a point of diminishing returns in learning. A variety of checking methods must be utilized, such as: *spelling bees* on trade terms; true-false tests; completion-type tests; and others.

A trainee preparing to learn the fundamentals of arc welding

Abbreviations and Symbols

In order to recognize the nature, use, location, and methods of fitting of each part of the ship, the trainee must begin early to learn the commoner abbreviations and symbols of the ship fitter. The best method for getting this material over to the trainee has been found to lie in the use of flash cards upon each of which a different abbreviation or symbol is printed in heavy black letters. No student should be satisfied with his mastery of this material until he can go through this stack of nearly 300 cards with very few errors of recognition.

It has also been found possible to reduce the tedium and boredom of this task and at the same time speed up the learning of much of the trade terminology (nomenclature) by combining the teaching of abbreviations with that of nomenclature. As the trainees learn the former from the cards, the study of *what the abbreviations stand for* can be begun, with appropriate illustrations, blackboard drawings, and the like. In this manner, when the trainee has learned his abbreviations he has also learned much of the important trade terminology at the same time.

Blueprint Reading and Sheet-Metal Work

The fundamentals of blueprint reading are emphasized at the Greenville classes for helper ship fitters through practical application in the sheet-metal shop. Under the direction of a competent instructor who has had years of sheet-metal work experience the trainee is taught to recognize the more common and ordinary geometrical patterns: square, rectangle, parallelogram, triangle, regular polygon, trapezoid, and the like. Then he reviews his mathematics to an extent sufficient to enable him to make accurately simple drawings and templates of his own. Mimeographed outlines are provided each trainee for his mastery in this connection, and then he begins to make drawings and templates from a standard text on sheet-metal pattern drafting.

In sheet-metal shop practice it is the rule that every bit of metalwork is to be done only after the appropriate pattern or template has first been made. The trainee begins with such simple construction as ash trays, bread pans, dustpans, and similar projects, and progresses until he can supply more precise parts for ship or airplane models. After participating in the construction of a tanker or destroyer the trainee usually can read perspective drawings of parts, mold loft plans or blueprints, and construct simple template molds. The sheet-metal work itself is also a useful experience, especially for the women, in preparation for actual helper work in the sheet-metal shops at the shipyard.

Order of Assembly

After the trainee has progressed far enough in the helper course to be able to see the relationship of various views of the vessel's parts; identify ship sections; locate frame station numbers, compartments, decks, etc. he is given a somewhat theoretical treatment of the order of assembly. First he reads an account in a standard ship-fitting text, observing all illustrations, and receiving necessary explanations by the instructor. This serves to create curiosity regarding certain points not clear already. The next step is to see motion pictures of the construction of the ship.

A series of motion-picture films is available showing the entire process of assembling a ship. From the standpoint of the interest of the ship fitter this series proceeds through all the important steps of ship construction, beginning with the setting of the keel block and cradle to the setting of the deck plates. Some of the reels are shown over and over again to the class, as often as the film and the time for its showing are available, since much of the material is new to the class at the first showing.

The fact that most of the instruction in the order of assembly is theoretical is not considered to be a drawback, since it is impossible at inland centers of training to offer practical applications along this line. Further than this, the course does not purport to train *ship fitters*, but rather *ship-fitter helpers* with enough know-how to carry out the ship fitter's instructions capably.

The Tools of the Ship-Fitter Helper

A short but important unit of the course concerns the tools which the helper will have to use at the yard. In the movies already

mentioned above, the trainee sees the tools in use: center punch, wedges, dogs, chalk, mauls, squares, soapstone, scriber, etc. He learns which tools are to be purchased by himself, and which are to be provided by the yard. A test is given him concerning these points, as well as the care of the tools.

Welding

Sharing first place with sheet-metal work for the amount of time spent in its practice is arc welding. The Greenville classes have oxy-acetylene and arc-welding torches, but the emphasis is upon arc welding. From the first day or two in class the trainee begins to get acquainted with elementary welding principles: use of the hood; adjusting the current (or gas, in oxwelding); and running simple beads. Although he welds a little each day, the trainee must limit his practice in this work, since equipment and booths are limited, and all trainees are scheduled to practice periods which must be adhered to.

Later on in the course the trainees are shown a series of movies on welding: oxwelding; cutting with the torch; arc welding fundamentals; horizontal, vertical, and overhead welding, etc. These films, some of which are in attractive technicolor, are most effective teaching aids, and apply directly to the daily practice of the trainee.

To encourage the student in regard to his progress over a period of days or weeks, a file of each person's practice welding beads is kept, so that the early beads can be compared with later ones. This nearly always shows encouraging progress, and also affords plenty of samples for illustration of good and bad welding.

After mastering the fundamentals of welding, the trainee is required to learn the welding symbols used in shipyards. These are studied from several texts, and a test on the commoner ones is then given.

Other Units of the Helper Ship-Fitter Course

Since the helper ship-fitter course was originally set up as a 180-hour training period, it has not been found possible to allow much time for several important units. Among these are the study of riveting, shop organization, and yard rules and regulations. Some students continue in the course beyond the required time, and in these cases work can be done in these and other extra fields. However, it is impossible to dissociate all elements of the ship-fitter's work, and much information is acquired, though haphazardly, and through reading on the side.

Instructional Aids and Teaching Devices

The Greenville classes for helper ship fitters combine in the teaching staff the features of experienced ship fitters, welders, and sheet-metal workers with experienced classroom teachers. This blend in faculty affords a quality of instruction at once practical and yet up to date in methodology and teaching ideas. No innovation that has appeared worthy and likely to save time has been overlooked. Featured in the instructional process here are visual education aids, models and illustrations, ample mimeographed and standardized lesson sheets and work pads, and testing at the end of every unit.

Audio-Visual Aids. At least two hours of each week are set aside for the showing of regularly scheduled movies of interest to prospective ship fitters, welders, loftsmen, and sheet-metal workers. A series on shipbuilding skills, and another series on arc welding are shown regularly in a cycle covering a five-week period, thus enabling most of the trainees to see both series in their entirety. Added to this are other films as they are made available from the bureau upon which local classes depend for their films. Among these are films relating to sheet-metal work; oxyacetylene welding; factory safety; first aid; building of an Army tank; films on measuring instruments (steel rule, micrometer, vernier scale, etc); and numerous other films which are calculated to bear upon the operations to be learned by ship fitter, welder, and sheet-metal helper trainees.

Models and Illustrative Materials. It has already been observed that the trainees collaborate from time to time in the construction of various models. Sometimes these are kept by the trainees, but more frequently they become the property of the helper ship-fitter class, and are used as illustrative material for the instruction of future trainees. Among such materials are to be found an assortment of templates (frame sections, bulkhead sections, etc); destroyer models; hulls; buttock-line charts; ship skeletons (showing frame stations and bulkheads); various nonnautical models such as airplanes, which serve to illustrate various points in blueprint reading, design, and sheet-metal work.

Blueprints and Plans. On the walls of the classrooms are to be found blueprints of war ships (but not of the latest design); schooners; trawlers; cargo vessels; pictures of ship construction at various stages. The study of these serves to augment the more superficial study of models.

Mimeographed Materials. It has been found that the most efficient methods of instruction as applied to classes which are constantly adding new students before earlier groups of enrollees have completed their hours must include lesson sheets for all units of training. For example, to accompany the unit on "Safety Rules and Regulations" there are four or five pages of pertinent questions based upon the reading of the text manual. Therefore when a new student is enrolled, if the instructor happens at that time to be busily engaged with some advanced trainees, he may simply turn over a copy of the manual and the study question sheets to the newcomer until he can give him personal attention. Thus the new student is never at a loss for something to do. In fact, the situation is just as frequently reversed: if the instructor chooses to spend time with the new enrollee, and if the advanced students have completed their work at hand, he can give the advanced students selected question sheets to accompany textual material on nomenclature; or leaflets illustrating welding symbols; or study materials concerning shipyard tools, their uses, and their care. In addition to such materials as these there are tests on each unit, though these are revised from time to time in order to keep them effective.

Textbooks. A bibliography of the textbooks most frequently consulted by instructors and students in the Greenville classes for training shipyard workers is presented below. Several of these are available in sufficient quantity to allow each trainee access to them at every class session.

W. J. Chaffee, *Arc Welding and How to Use It* (Troy, Ohio: The Hobart Bros. Company, 1938).

Commonwealth of Pennsylvania, Department of Public Instruction, *Shipfitting Practice* (Bulletin 345), Harrisburg. 1941.

Frank L. Ogilvie, *Sheet Metal Pattern Drafting Made Easy* (New York: Sheet Metal Publication Co., 1937).

Albert A. Owens and Ben F. Slingluff, *How to Read Blueprints* (Philadelphia: the John C. Winston Company, 1938).

S. S. Rable, *Ship and Aircraft Fairing and Development* (New York: Cornell Maritime Press, 1941).

W. E. Swanson, *Modern Shipfitter's Handbook* (New York: Cornell Maritime Press, 1941).

United States Navy Department, *Nomenclature of Naval Vessels* (Washington: U. S. Government Printing Office, 1941). (Reproduced by District Office, State Department of Education of South Carolina, by permission of Charleston Navy Yard.)

Appraisal of the Greenville Course of Shipyard Helpers

It is obviously impossible to expect a finished ship-fitter helper from the brief 180-hour course here described. Further than the time limitation is the fact that the course is offered inland, where many of the trainees have never even seen the ocean, much less an ocean-going vessel. However all this may be, it is none the less true that results have been well-nigh phenomenal in point of actual results. Officials at the Charleston Navy Yard have been high in their praise of the Greenville products who entered the yard as helpers there, many of whom are now rated as full ship fitters, welders, or loftsmen. More important than this generalization, however, is the fact that numerous shipyards are increasingly calling upon the Greenville classes for more and more workers who have been certified after completing their hours. Within the 14-month period from January, 1942, to March, 1943, approximately 400 workers had gone from the Greenville classes at the Parker and Greenville High Schools to the Charleston Navy Yard and other Naval and private shipbuilding yards at eastern and southeastern ports, including ports along the Gulf of Mexico. About 15 per cent of these have been women, who form an increasing percentage of present placements. During the month of

February, 1943, when this report was made out, approximately 40 men and women trainees left these classes for two rapidly expanding yards. These figures are conservative, since many trainees finish the course and are never heard from again, as they are not required to report whether or not they have taken employment at a yard. Local reports are based upon direct information received from the workers themselves. It may be safely stated, however, that the classes described here have achieved a degree of success that merits examination from the standpoint of providing ideas for similar classes conducted in other sections of the nation.

An Experiment in Summer Employment for Industrial-Arts Teachers

F. C. FINSTERBACH*

The plan presented herein was put into effect last year by the Western New York Industrial Arts Teachers Club. The outline and some details of the plan are presented because of the more urgent need for trained men in industry, and with the hope that other teachers' organizations or individuals might benefit from the experience. What was urgent last summer is now vital, and an even better response should be forthcoming.

*Instructor, Industrial Arts Laboratory, School Eighteen, Buffalo, N. Y.

Essentially, the idea for the plan came to the president of the above-mentioned club. Step 1 was the writing of a letter to the president or personnel director of local industrial plants. A specimen of the initial letter follows:

DEAR SIR:

Permit me to present a proposition in which you, as president of the ..... Corporation, might be interested.

The members of the Western New York Industrial Arts Teachers Club will be at liberty from July 1 to September 1. They are impressed with the urgent need for experienced men in industry and are anxious to lend themselves to

WESTERN NEW YORK INDUSTRIAL-ARTS TEACHERS CLUB

Application for Summer Employment

Name _____ Home Address _____ Tel. _____

School _____ School Address _____ Tel. _____

Age ____ Place of Birth _____ Weight ____ Height ____

Years of Teaching Experience. _____ | Encircle grades 6 - 7 - 8 - 9 - 10 - 11 - 12

Types of work now teaching _____

EDUCATIONAL EXPERIENCE:

High School _____ Course _____

College _____ Degree _____

University _____ Degree _____

INDUSTRIAL EXPERIENCE:

Name of Firm	Kind of Work	How Long?

PERSONAL RATING Types of Work	Train-ing ( )	Indus. Exp.( )	Personal Est. of Skill Low	Avg.	High	Job Pref.
Mechanical Drafting						
Machine Shop						
Sheet Metal						
Foundry Practice						
Patternmaking						
Forging and Heat Treat.						
Cabinetmaking						
Air-Gun Painting						
Painting and Finishing						
Electric Wiring						
Welding						
Carpentry						
Inspecting						
Printing						
Others:						

I HAVE HAD EXPERIENCE WITH THE FOLLOWING MACHINES:

Machine	Setting Up ( )	Operat-ing ( )	Machine	Setting Up ( )	Operat-ing ( )
Machine Lathe			Wood-Turning Lathe		
Shaper			Metal-Spin. Lathe		
Drill Press			Sheet-Metal Brake		
Grinder			Squaring Shears		
Milling Machine			Forming Rolls		
Circular Saw					
Band Saw					

LIST: Other experiences which would tend to indicate your possible value as an employee:

REFERENCES:

Name	Address	Position

Remarks: _____

Form 1. Application blank. The members who were interested filled out this form. It was then sent to the various plants

the task at hand for the two-month interval.

All of these men are college graduates, have a varied experience in mechanical work of all kinds, and in addition have taught industrial processes and operations for many years.

They should be able to quickly adjust themselves in your plant and would be productive right from the start.

In addition, they would have an opportunity to renew their acquaintance with industry and because of this become better teachers when they return to their schools in the fall.

If you are at all interested in this proposition, our club will be glad to present, in graphic form, a summary of the special abilities of each man together with any necessary recommendations.

Our interest as a club is threefold: first, we desire our members to keep up contact with industry, because we feel that only by continued contact can they properly present their subject to students. Secondly, we want to do our bit in the War Production Program in the most tangible way. Thirdly, in view of the rising cost of living, we wish to augment our income and to profitably spend our surplus time.

The club will aid your personnel director in selecting and placing its members in positions where they will be of most use to your concern. Our committee has provided an experience form which will help you form an opinion on each man.

As an indication of the capabilities of our members, each has had school training in sheet-metal work; machine-shop work; woodwork, cabinet, or patternmaking; mechanical drafting; printing; foundry practice; forging and heat-treating; in addition to physics, chemistry, higher mathematics, and the usual college academic courses.

We would appreciate your consideration of our plan and an opportunity to talk it over with you at your convenience.

Very truly yours,
Western New York Industrial Arts Teachers Club
By: .....
President

These letters evoked varying replies — from polite refusals to enthusiastic acceptance. At any rate the club received enough acceptances to secure employment for all available members.

The next step for the individual member was to fill out the plant's application blank, present his birth certificate, or other evidence of citizenship, get his physical examination, and be photographed and fingerprinted, after which he was ready to go to work.

After the members were placed and working for about two weeks, the president of the club checked with the firms involved, and received excellent reports of their progress.

At the conclusion of the summer working period, a letter of thanks and appreciation was sent to each of the firms which had participated in the plan.

Most of the men were asked by their foremen and the employment managers to return to work this summer.

About thirty members took advantage of the plan, received much in terms of industrial experience, and returned to their schools with altered perspective if not exactly renewed vigor.

A census of placement shows that the members worked as lathe hands, layout men, surface grinders, mill hands, millwrights, detailers, tool designers, tracers, electricians, and inspectors.

Most of the men worked 48 hours per week, and the whole unit working ten weeks, earned something like $18,000 in wages.

Teacher Personnel Shortages in Industrial Arts

HAROLD J. BOWERS*

That a serious shortage of industrial-arts teachers exists is evidenced by the fact that during the current school year over six hundred industrial-arts departments have been closed in the schools of the United States because there are no qualified teachers available. In over eight hundred other schools the industrial-arts teaching is being done by undertrained, temporarily certificated teachers. That this situation will be much more acute by September 1, 1943, is everywhere agreed.

The purpose of this article is to attempt an explanation of the causes of this situation and to suggest emergency measures which may alleviate its effects.

Industrial arts is not the only field of teaching experiencing a teacher shortage. The entire teaching profession is at the present undergoing a personnel disturbance, which if unchecked, threatens to seriously impair the entire system of public education. Personnel disturbances are, however, not new to educators. The profession has from the beginning been subjected to a series of such disturbances which usually bear a close relationship to the business cycle. Generally there is a teacher shortage in times of prosperity, and a teacher surplus in times of depression. From these well-known facts, it is only natural to assume that after a year of all-out war production in which American business and industry have established new peaks, the teacher supply will hit a new low. This relationship of teacher supply to business conditions indicates that in a period of business activity, teachers are drawn into business and industrial employment at salaries with which schools cannot compete. This, however, does not apply to all fields of teaching indiscriminately. Some teachers by the very nature of the training for their fields of teaching are not fitted for immediate employment in industry. On the other hand, teachers of skill subjects such as industrial arts, stenography, typing, office practice, science, mathematics, and vocational subjects are well trained for positions in business and industry, and are able to accept such positions without further training. In addition to the higher salary appeal of such positions, many teachers feel that such employment makes a more direct contribution to the war effort. Then, too, there has been nothing thus far in our national man-power policy to indicate that teaching is essential or patriotic.

Certification officials in 25 out of 39 states reporting, aver that the current acute industrial-arts teacher shortage is due to the lure of higher salary positions in industry. These same officials state that the second most important factor is selective service. Eleven other certification officials list selective service as the most important factor. In most instances industrial-arts teachers and their employers have not sought deferment or exemption. If selective service were the only factor affecting teacher supply, it seems possible that sufficient adjustments could have been made to prevent the closing of most departments.

One other factor contributing to the current shortage is the fact that there was no adequate supply of industrial-arts teachers to meet the demand even before Pearl Harbor. Of the 39 state certification officials reporting on this question, 23 report that such was the case in their states. Sixteen states report that they had an adequate supply prior to our entry into the war. In those states having an inadequate supply, it might be assumed that public schools were adding industrial arts to the curriculum more rapidly than teachers were being recruited and trained for such positions.

Teacher supply data are usually based upon the number of teachers who have satisfied the minimum requirements prescribed by the state and who in turn hold valid certificates and are available for teaching positions. Demand data are usually based on the number of positions for which no applicants are available,

*Supervisor, Division of Certification, Ohio State Department of Education, Columbus, Ohio.

and the number of undertrained persons whom it is necessary to certificate temporarily to cope with an emergency. The standards of training upon which the 800 temporarily certificated industrial-arts teachers were certificated, indicates the extent to which standards have been lowered. These lowered standards are also an index to the standards of competency and efficiency of instruction in schools employing these teachers.

The minimum requirement for standard certification in most states is a degree in education with from 15–30 semester hours of specialized training in industrial arts. The current minimum requirements for temporary certificates in industrial arts varies from a degree with 15 semester hours of credit in industrial arts to high school graduation with evidence of industrial experience. In some few instances, evidence of high school graduation has been waived and certification is based entirely upon experience in industry. In twenty states the current practice seems to be the granting of temporary or emergency certificates in industrial arts on the basis of experience rather than college training.

In addition to lower standards which permit the certification of artisans, other emergency measures are being undertaken in a desperate attempt to keep industrial-arts departments functioning. These measures include the recruitment and training of women and physically handicapped men, and the establishment of circuits for teachers likely to remain in service.

It is generally agreed that no substantial relief may be anticipated for the duration. It, therefore, behooves educators to concentrate their energies on holding teachers now in service and recruiting the most desirable personnel available for emergency appointment for the duration.

Since the most important factor affecting the current situation is economic, that is, the inability of schools to compete with the current wage scale of business and industry, it is obvious that raising teachers' salaries would prove the most effective, and probably the most just remedy.

Ten states report that bills designed to increase state support of public education have been introduced in state legislatures now in session. Other states are urging local boards of education to increase teachers' salaries. Others now paying the maximum possible under existing means of finance are urging federal aid. Such action will undoubtedly have a desirable effect, but with current increases in federal taxation it seems unlikely that any substantial increases for education may be granted.

A sharp decrease in urban high school enrollment, served to conserve teacher supply and permit slight increases in salaries. In rural areas a vigorous policy with respect to the consolidation of small units achieves the same result.

The present regulations of the Office of Defense Transportation may in some communities result in substantial savings in pupil transportation costs which may be applied to teachers' salaries.

The second most important factor in the current teacher shortage, selective service, is one which the profession itself is powerless to do anything about. Until industrial-arts instruction is regarded as essential to our war effort by selective service and man-power officials, the schools of the country may expect to continue to lose teachers in service as well as those prospective teachers now in training. The only source of supply for replacements seems to be from the ranks of older and physically disabled men.

Some states are attempting to recruit and train women for these positions, but thus far they have not met with much success, chiefly because women are not interested in this area of teaching, and boards of education have been reluctant to employ them.

The most successful attempts at recruiting seem to be within the school faculty itself. School administrators have been able, through slight salary increases, to persuade some of the faculty members to enroll in evening, Saturday, or summer school classes for intensive training which has been approved by state departments of education for temporary certification, for the duration.

Even where it is possible to apply all of the suggested plans, it seems certain that industrial-arts instruction within the next few years is destined to hit a new low in efficiency.

This is most unfortunate, particularly at a time when the school's greatest contribution to the war effort is that type of instruction which aids the student in discovering his abilities and developing those skills which best fit him for business, industry, and military service. It should, therefore, go without saying that the longer the war continues the more difficult will it become to find replacements.

Teaching Materials for Industrial Education

CHRIS H. GRONEMAN*

(*Continued from page 202 of the May, 1943, issue*)

P. H. Glatfelter Co., Spring Grove, Pa.			
A Short Course in Paper Making	16mm.	Sound	Free
Goodyear Rubber Co., Akron, Ohio			
Conquering the Jungle	16mm.	Silent	Free
Conquering the Desert	16mm. & 35mm.	Sound & Silent	Free
Modern Coal Mining	16mm. & 35mm.	Silent	Free
The Island of Yesterday	16mm. & 35mm.	Silent	Free
America's Heritage	16mm. & 35mm.	Silent	Free
Men in the Making	16mm. & 35mm.	Silent	Free
The Story of the Airship	16mm. & 35mm.	Sound & Silent	Free
Magellan of the Air	16mm. & 35mm.	Silent	Free
Lightning Proof	16mm. & 35mm.	Silent	Free
Greatest Airship Dock	16mm. & 35mm.	Silent	Free
The Story of the Tire	16mm. & 35mm.	Sound & Silent	Free
Cushioned Landings	16mm. & 35mm.	Silent	Free
Circling the Globe	16mm.	Silent	Free
The U. S. S. Akron	16mm. & 35mm.	Silent	Free
Balloons	16mm. & 35mm.	Sound & Silent	Free
When Industry Plays	16mm. & 35mm.	Sound & Silent	Free
The Air Fleet	16mm. & 35mm.	Silent	Free
One Point Landing	16mm. & 35mm.	Silent	Free
Thrills and Spills	16mm. & 35mm.	Silent	Free
The Inner Tube	16mm. & 35mm.	Silent	Free
The U. S. Macon	16mm. & 35mm.	Silent	Free
Farmer Miller in High Gear	16mm. & 35mm.	Silent	Free
The Air Fleet	16mm. & 35mm. 15 min.	Silent	Free
Hammermill Paper Co., Erie, Pa.			
The Voice of Business	16mm.	Silent	Free
HarFilms, Inc., New Orleans, La. (Unless otherwise specified silent films are $1 per reel, and sound films are $2 per reel.)			
Shrimp Industry	16mm.	Silent	
Oyster Industry	16mm.	Silent	
Sugar — The Sweetest Story Ever Told	16mm.	Sound	
Turpentine and Resin Industry	16mm.	Silent	
Reforestation	16mm.	Silent	
Handling and Storing of Cotton	16mm.	Silent	

*Industrial Education Department, A. & M. College of Texas, College Station, Tex.

The Tung Oil Industry of China and America	16mm.	Sound & Silent	
Logging in the South	16mm.	Sound & Silent	
Handling of Bananas	16mm.	Sound & Silent	
Sulphur Industry	16mm.	Sound & Silent	
Strawberry Industry	16mm.	Silent	
Coffee Industry of Costa Rica, C. A.	16mm.	Sound	$3 rental
Construction Air Propelled Ships	16mm.	Silent	

Ideal Pictures Corp., 28 E. Eighth St., Chicago, Ill.

Electricity	16mm.	Sound	$1.50 per reel
Government and History	16mm.	Sound	Consult catalog
Health and Safety	16mm.	Sound	$1.50 per reel
Industries of the U. S.	16mm.	Sound	$1.50 per reel

(General catalog also contains other listings on the story of civilization, handicraft teaching, marine and aquatic studies; all defense reels listed in Victory Catalog.)

International Acetylene Assoc., 30 East 42nd St., New York, N. Y.

The Prosperity Process	20 min. 16mm.	Silent	Free
Profits of Progress	10 min. 16mm.	Sound	Free

International Harvester Co., Inc., 180 North Michigan Ave., Chicago, Ill.

The Story of Binder Twine	16mm. & 35mm.	Sound	Free
The Building of Boulder Dam	16mm. & 35mm.	Sound	Free
Soybeans for Farm and Industry	16mm. & 35mm.	Sound	Free
International Logging	16mm. & 35mm.	Sound	Free
From Trees to Lumber	16mm. & 35mm.	Sound	Free
The Right Material in the Right Place	16mm. & 35mm.	Sound	Free
Power for the Oil Industry	16mm. & 35mm.	Sound	Free
Our Daily Bread	16mm. & 35mm.	Sound	Free
Earth Moving	16mm. & 35mm.	Sound	Free
The International Harvester Diesel	16mm. & 35mm.	Sound	Free
Romance of the Reaper	16mm. & 35mm.	Sound	Free
The Building of Boulder Dam	16mm. & 35mm.	Sound	Free
New Oil Field Methods	16mm. & 35mm.	Sound	Free

Iowa State College, Ames, Iowa

Asbestos	30 min. 16mm.	Silent	$1
Behind the Cup	30 min. 16mm.	Silent	Free
Civilization Fabric	25 min. 16mm.	Silent	Free
Evolution of the Oil Industry	60 min. 16mm.	Silent	$1
NS-959 *Nickel Milling and Smelting*	17 min. 16mm.	Sound	50c
NS-958 *Nickel Mining*	16 min. 16mm.	Sound	50c
NS-960 *Nickel Refining*	11 min. 16mm.	Sound	50c
The Pottery Maker	13 min. 16mm.	Silent	$1
Rags to Roofs	30 min. 16mm.	Silent	Free
Romance of Glass	30 min. 16mm.	Sound & Silent	50c
Story of Spark Plug	30 min. 16mm.	Sound & Silent	$1
N-835 *Steel, Making and Shaping — Raw Materials*	16mm.	Sound	50c
N-836 *The Making of Steel*	16mm.	Sound	50c
N-837 *Flat Rolled Products*	16mm.	Sound	50c
N-838 *Bars and Structural Shapes*	16mm.	Sound	50c
N-839 *Rails, Wheels, and Axles*	16mm.	Sound	50c
N-840 *Wire and Wire Products*	16mm.	Sound	50c
N-841 *Pipe and Tube Manufacture*	16mm.	Sound	50c
Storage Battery	30 min. 16mm.	Silent	$1
Sulphur	30 min. 16mm.	Silent	$1
Right Materials in Right Place	22 min. 16mm.	Sound	50c

Johnson and Son, Inc., Racine, Wis.

Beauty for Keeps	26 min.	Sound	Free

Kearney and Trecker Corp., Milwaukee, Wis.

Production Plus	16mm.	Silent	Free
Production Plus	35mm.	Slides	Free
Rotary Head	16mm.	Sound	Free
Milling Practice	35mm.	Vocafilm	Charge
	35mm.	Disk Records	Charge
Plastics in Engineering	16mm. & 35mm.	Sound Slides	Free

Lincoln Electric Co., 12818 Coit Road, Cleveland, Ohio

Steel Houses	16mm.	Silent	Free
Modern Pipe Line	16mm.	Silent	Free
Automatic Welding	16mm.	Silent	Free
Modern Building Construction	16mm.	Silent	Free
Manufacturing by Arc Welding	16mm.	Silent	Free

Linde Air Products Co., 30 East 42nd St., New York, N. Y.

Oxwelding and Cutting — The Modern Method of Joining and Severing Metals	15 min. 16mm.	Silent	Free
Automatic Machine—Cutting With the Oxweld Type CM-12 Shape-Cutting Machine	25 min. 16mm.	Silent	Free
Oxwelding and Cutting in Production	15 min. 16mm.	Silent	Free
Flame-Cutting of Billets and Bars	15 min. 16mm.	Silent	Free
The Multi-Flame Lindewelding Head for Pipe Line Welding	15 min. 16mm.	Silent	Free
Hard-Facing — A Key to Modern Industrial Efficiency	30 min. 16mm.	Silent	Free

Mahogany Association, Inc., 75 East Wacker Drive, Chicago, Ill.

The Romance of Mahogany	2 reels 30 min.	Silent	Free
The Romance of Mahogany	3 reels 45 min.	Silent	Free
Masterpieces in Mahogany	2 reels 30 min.	Silent	Free

Metropolitan Life Insurance Co., New York, N. Y.

Once Upon a Time	16mm. & 35mm.	Sound	Free
Man Against Microbe	16mm. & 35mm.	Sound & Silent	Free

Motion Picture Bureau, 347 Madison Ave., New York, N. Y.

Underwater Speechways	10 min.	Sound	Free
The Test Supreme	10 min.	Sound	Free
Firestone Puts the Farm on Rubber	30 min.	Sound	Free
The Fourth Kingdom	40 min.	Sound	Free
Science Saves the Surface	40 min.	Sound	Free
Where Mileage Begins	20 min.	Sound	Free
New Romance of Glass	20 min.	Sound	Free
Voices in Paper	10 min.	Sound	Free
Diesel — The Modern Power	20 min.	Sound	Free
Modes and Motors	10 min.	Sound	Free
Young America Paints	10 min. 16mm.	Sound	Free
How Young America Paints	10 min. 16mm.	Sound	Free
Symphonies in Stone (series of 8) each	10 min. 16mm.	Sound	$1.50
The Land	40 min. 16mm.	Sound	Free
Telephone Arsenal	20 min. 16mm.	Sound	Free
Mines Above Ground	20 min. 16mm.	Sound	Free
It's Up to Us	10 min. 16mm.	Sound	Free
For America We Save	30 min. 16mm.	Sound	Free
The Voice That Science Made	10 min. 16mm.	Sound	Free
This Amazing America	30 min. 16mm.	Sound	Free
Foods for Freedom	10 min. 16mm.	Sound	Free
The Onimous Arms Case	20 min. 16mm.	Sound	Free

Motion Picture Service, Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa.

On the Pathways of Progress[3]	16mm. & 35mm.	Silent	Free
White Coal[4]	16mm. & 35mm.	Silent	Free
Wildwood, a 100% Mechanized Mine[5]	16mm. & 35mm.	Silent	Free
The New Frontiers	16mm. & 35mm.	Sound	Free
The Kilowatt Trail	16mm. & 35mm.	Sound	Free

National Headquarters of Boys Clubs, 381 Fourth Ave., New York, N. Y.

The Building of Boys	16mm. & 35mm.	Sound	Free

[3]Obtain from U. S. Bureau of Mines, 4800 Forbes St., Pittsburgh, Pa. Known by Bureau of Mines as "Railroad Transportation."
[4]Obtain from U. S. Bureau of Mines. Known as "Water Power."
[5]Obtain from U. S. Bureau of Mines.

Norton Company, Worcester, Mass.

Lessons in Grinding —			
1. Cutter Sharpening	14 min.	Sound	Free
2. The Cylindrical Grinder	20 min.	Sound	Free
Norton Abrasives	20 min. 16mm.	Sound	Free
Norton Grinding Wheel Markings	7 min. 16mm.	Sound	Free
Offhand Grinding With Norton Abrasive	10 min. 16mm.	Sound	Free
Norton Abrasives in Tool Grinding	10 min. 16mm.	Sound	Free
Precision With Norton Abrasives	17 min. 16mm.	Sound	Free

Pan American Union, Washington, D. C.

Coffee — From Brazil to You	16mm. & 35mm.	Sound	Free

Pyrene Manufacturing Co., 444 North Lake Shore Drive, Chicago, Ill.

Extinguishing Fire in Magnesium and Incendiaries	16mm.	Silent	Free
Fighting the Fire Bomb	14½ min. 16mm.	Sound	Free

Douglas D. Rothacker, 729 Seventh Ave., New York, N. Y.

This Changing World	16mm. & 35mm.	Sound	Free
Heritage	16mm. & 35mm.	Sound	Free
Nickel Refining	16mm.	Sound	Free
Nickel Mining	16mm.	Sound	Free
Nickel Milling and Smelting	16mm.	Sound	Free
Nickel Highlights	16mm.	Sound	Free
Men, Metals, and Machines	16mm.	Sound	Free
Sulphur	16mm.	Silent	Free

Sears-Roebuck Agricultural Foundation, Arthington St. and Homan Ave., Chicago, Ill.

Under the 4-H Flag	78 min. 16mm.	Sound	Free
Hidden Values	20 min. 16mm.	Sound	Free
National Farm News Reel	18 min. 16mm.	Sound	Free
National Farm Oddities	2 reels 16mm.	Sound	Free
Southern Sunrise	2 reels 16mm.	Sound	Free
Producing Pork for Victory	23 min. 16mm. and 35mm.	Sound	Free

Society for Visual Education, Inc., 100 East Ohio St., Chicago, Ill.

Auto Mechanics, Part I	35mm.	Silent	$2
Auto Mechanics, Part II	35mm.	Silent	$2
Brick and Stone Masonry	35mm.	Silent	$2
Cabinetmaking	35mm.	Silent	$2
Carpentry	35mm.	Silent	$2
Cement Finisher	35mm.	Silent	$2
Electrical Workers	35mm.	Silent	$2
General Farming, Part I	35mm.	Silent	$2
General Farming, Part II	35mm.	Silent	$2
Highway Jobs	35mm.	Silent	$2
Machine Shop Mechanics	35mm.	Silent	$2
Molding and Coremaking	35mm.	Silent	$2
Painters and Decorators	35mm.	Silent	$2
Patternmaking	35mm.	Silent	$2
Plasterers	35mm.	Silent	$2
Plumbers and Steam Fitters	35mm.	Silent	$2
Sheet Metal Work	35mm.	Silent	$2
Structural Steel Workers	35mm.	Silent	$2
Welding As an Occupation	35mm.	Silent	$2

South Bend Lathe Works, South Bend, Ind.

The Metal Working Lathe[6]	20 min.	Sound	Free
Plain Turning[6]	20 min.	Sound	Free

Standard Brands, Inc., New York, N. Y.

The Story of a Loaf of Bread	16mm.	Silent	Free
In the Dough	16mm.	Sound & Silent	Free
Enzymes in Dough Fermentation	16mm.	Silent	Free
The Story of Frozen Eggs	16mm.	Silent	Free

Tanners' Council of America, 100 Gold St., New York, N. Y.

The Story of Leather	16mm. & 35mm.	Silent	Free
The Story of Leather	16mm.	Sound	Free

Tennessee Valley Authority, Knoxville, Tenn.

Waste Waters	16mm. & 35mm.	Silent	Free
Motion Study Applied to Letter Indexing	16mm. & 35mm.	Sound	Free
Norris Dam Construction	16mm. & 35mm.	Silent	Free
Electricity on the Farm	16mm. & 35mm.	Silent	Free
Shell Mounds in the Tennessee Valley	16mm. & 35mm.	Silent	Free
Scenic Resources of the Tennessee Valley	16mm. & 35mm.	Silent	Free
Building Land and People	16mm.	Silent	Free
The River	30 min. 16mm.	Sound	Free
Wilson Dam School[7]	20 min. 16mm.	Sound	Free
Malaria Control in the Tennessee Valley[8]	20 min. 16mm.	Silent	Free
Fishing on the Great Lakes of the South[9]	20 min. 16mm.	Silent	Free

U. S. Department of Agriculture, Division of Extension Information, Washington, D. C.

Clearing Land	16mm. & 35mm.	Silent	Free
Forest and Men	16mm. & 35mm.	Sound	Free
Forest Fires or Game	16mm. & 35mm.	Sound	Free
Friends of Man	16mm. & 35mm.	Silent	Free
It Might Have Been You	16mm. & 35mm.	Silent	Free
Lest We Forget	16mm. & 35mm.	Silent	Free
Preventing Forest Fires — No. 1, 2, 3	16mm. & 35mm.	Sound	Free
What Price Forest Fires?	16mm. & 35mm.	Silent	Free
Unburned Woodlands	16mm. & 35mm.	Silent	Free
Harvesting Uncle Sam's Timber	16mm. & 35mm.	Silent	Free
Marking Timber	16mm. & 35mm.	Silent	Free
New Woods for Old	16mm. & 35mm.	Silent	Free
Tree of Life	16mm. & 35mm.	Sound	Free
Two Generations of Wood	16mm. & 35mm.	Silent	Free
The ABC of Forestry	16mm. & 35mm.	Sound	Free
Operation of a Forest Nursery	16mm. & 35mm.	Silent	Free
Forest and Health	16mm. & 35mm.	Silent	Free
How Forests Serve	16mm. & 35mm.	Silent	Free
Cooperative Marketing of Dried Prunes	16mm. & 35mm.	Silent	Free
Canned Lima Beans	16mm. & 35mm.	Silent	Free
Cooperative Wool From Fleece to Fabric	16mm. & 35mm.	Sound	Free
Marketing and Manufacture of Wool	16mm. & 35mm.	Silent	Free
The River	16mm. & 35mm.	Sound & Silent	Free

U. S. Department of Commerce, Washington, D. C. Bureau of Standards

Commerce Around the Coffee Cup	16mm. & 35mm.	Silent	Free

U. S. Department of Interior, Washington, D. C.

The Sugar Industry	16mm. & 35mm.	Sound	Free
Boulder Dam	16mm. & 35mm.	Sound	Free

U. S. Department of the Interior Bureau of Mines, Pittsburgh, Pa.

Aluminum Fabricating Process	16mm. & 35mm.	Silent	Free
Aluminum: Mine to Metal	16mm. & 35mm.	Silent	Free
Automobile Lubrication	16mm.	Silent	Free
Construction That Endures	16mm. & 35mm.	Silent	Free
Copper Leaching and Concentration	16mm. & 35mm.	Silent	Free
Copper Mining	16mm. & 35mm.	Silent	Free
Copper Refining	16mm. & 35mm.	Silent	Free
Copper Smelting	16mm. & 35mm.	Silent	Free
Evolution of Oil Industry	16mm. & 35mm.	Silent	Free
Evolution of Oil Industry	16mm.	Sound	Free
Follow the White Traffic Marker	16mm. & 35mm.	Silent	Free
From Mountain to Cement Sack	16mm. & 35mm.	Silent	Free
Sulphur	16mm. & 35mm.	Silent	Free
	16mm.	Sound	Free
Through Oil Lands of Europe and Africa	16mm. & 35mm.	Silent	Free
Transportation	16mm.	Silent	Free
Valves	16mm. & 35mm.	Silent	Free
Water Power	16mm. & 35mm.	Silent	Free
Glimpses of Texas	16mm. & 35mm.	Silent	Free
Making a V-Type Engine	16mm. & 35mm.	Silent	Free
Manufactured Abrasives	16mm.		Free

[6]These films are limited to defense training classes.

[7]An educational film developed by the Alabama State Department of Education and TVA to demonstrate modern teaching methods. The picture describes a typical day at the Wilson Dam School.

[8]Available from Health and Safety Department, Chattanooga, Tenn.

[9]Available from Forestry Relations Department, Norris, Tenn.

Modern Metalworking	16mm. & 35mm.	Silent	Free
Nickel	16mm.	Sound	Free
Nickel	16mm. & 35mm.	Silent	Free
Power Within	16mm. & 35mm.	Silent	Free
	16mm.	Sound	Free
Safety Glass	16mm. & 35mm.	Silent	Free
Story of a Spark Plug	16mm. & 35mm.	Silent	Free
	16mm.	Sound	Free
Story of a Storage Battery	16mm. & 35mm.	Silent	Free
Story of Asbestos	16mm. & 35mm.	Silent	Free
Story of Gasoline	16mm.	Silent	Free
Story of Lead Mining	16mm.	Sound	Free
Story of Lead Milling, Smelting, and Refining	16mm.	Sound	Free
Story of Lubricating Oil	16mm.	Silent	Free
Story of Steel	16mm.	Silent	Free
Wildwood, a 100% Mechanized Mine	16mm. & 35mm.	Silent	Free
Fabrication of Copper	16mm. & 35mm.	Silent	Free
Alloy Steels	16mm. & 35mm.	Sound	Free
Arizona — Its Mineral Resources, etc.	16mm.	Sound	Free
Diesel: The Modern Power	16mm.	Sound	Free
Nickel Highlights	16mm.	Sound	Free
Lubrication	16mm.	Sound	Free
Heat and Its Control	16mm.	Sound	Free
Story of Rock Wool Home Insulation	16mm.	Sound	Free
U. S. Department of Labor, Division of Labor Standards, Washington, D. C.			
Stop Silicosis	16mm. & 35mm.	Sound	Free
U. S. Maritime Commission, Washington, D. C.			
Good Neighbors	16mm. & 35mm.	Sound & Silent	Free
U. S. Steel Corporation, 436 Seventh Ave., Pittsburgh, Pa.			
Steel — Man's Servant	38 min. 16mm. & 35mm.	Sound	Free
The Making and Shaping of Steel	16mm.	Silent	Free
	16mm. & 35mm.	Sound	Free
U. S. S. Cor-Ten	20 min. 16mm. & 35mm.	Sound	Free
Steel for Victory	16mm. & 35mm.	Sound	Free
Arteries of Industry	16mm. & 35mm.	Silent	Free
(Available only from National Tube Co., Frick Building, Pittsburgh, Pa.)			
Walls Without Welds	60 min. 16mm. & 35mm.	Silent	Free
(Available only from National Tube Co., Frick Building, Pittsburgh, Pa.)			
Bridging San Francisco Bay	45 min. 16mm.	16mm.	Free
Universal Handicrafts Service, Inc., 1267 Sixth Ave., New York, N. Y.			
The Joy of Self Expression Through Handicrafts	25 min.	Silent	Free
Vermont Marble Co., Proctor, Vt.			
Mountains of Marble	22 min.	Sound	Free
Westclox, General Time Instrument Corp., La Salle, Ill.			
The People's Friend	27 min. 16mm.	Sound	Free
Western Pine Association, Yeon Building, Portland, Ore.			
Harvesting the Western Pines	16mm.	Sound	Free
Fabricating the Western Pines	16mm.	Sound	Free
Building a Home With Western Pines	16mm.	Sound	Free
Weyerhauser Sales Co., St. Paul, Minn.			
Trees and Men	45 min. 16mm.	Sound	Free
Trees and Homes	30 min. 16mm.	Sound	Free
Willard Storage Battery Company, 246–286 E. 131st St., Cleveland, Ohio			
Willard and You	30 min. 16mm.	Sound	Free

Problems and Projects

VICTORY GARDEN TOOLS

N. H. POOLE

Emmerich Manual Training High School
Indianapolis, Ind.

At the end of the school year there are usually odds and ends of metal and tools that can be worked into useful projects. It is the purpose of this article to suggest a few possibilities for converting scrap materials into garden tools. Since scrap materials are used, the sizes shown in Figures 2, 4, and 7 are suggestive only and will have to be changed to suit the materials that may be on hand.

Figure 1 shows garden and yard weeders made from an old wood chisel and from an old wood-turning skew chisel. In reworking tool steel it should first be annealed. To do this, heat the steel to a bright cherry red and allow it to cool slowly in the heat treating furnace, or bury it in warm dry ashes or sand. After annealing, the metal is reheated, the blade drawn to shape and thickness, and the V is cut with the hot cut chisel. Next forge the handle to shape and bend to the proper angle. When the metal has cooled, file the cutting edges true and sharp.

To reharden the blades, heat them to a bright cherry red and quench in oil, moving it about in the oil. Then quickly polish the points with a buff stick (a stick with a sheet of emery cloth tacked on it), and when the temper color of straw shows at the cutting points, cool the whole tool. Remove forge tool marks and scale on the grinder. Fit the handle and polish the blade.

A good rough polishing wheel, such as the one shown in Figure 3, may be made by taking several old canvas buffers and bolting

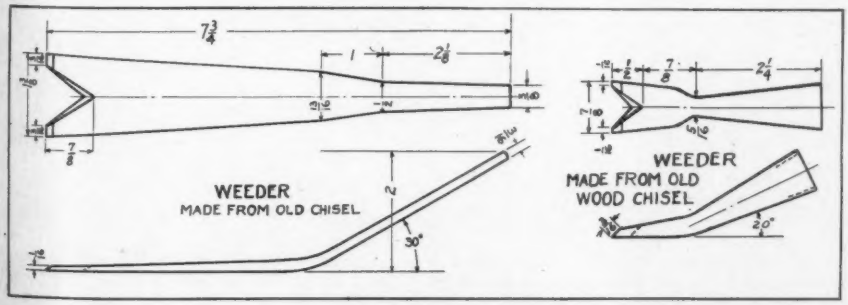


Fig. 2

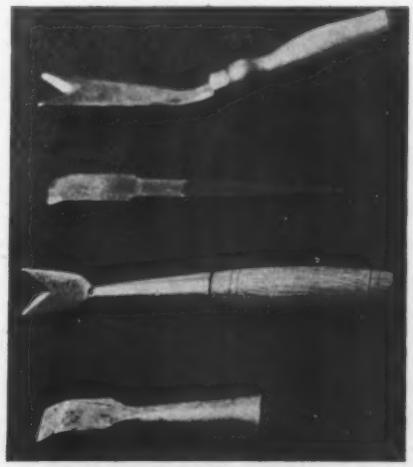


Fig. 1

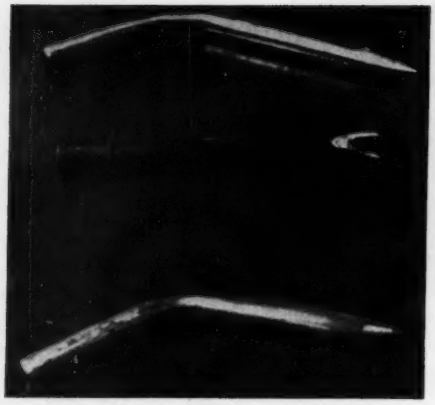


Fig. 4

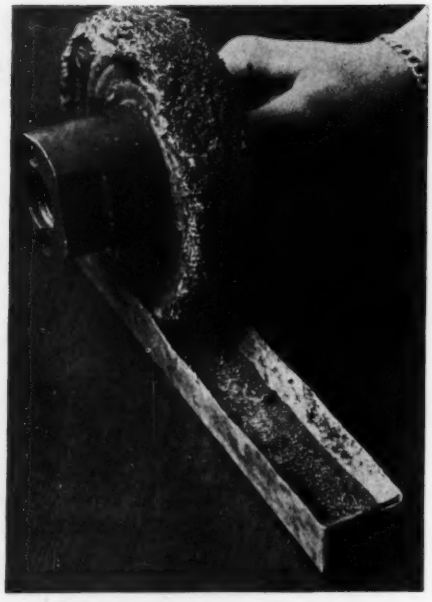


Fig. 3

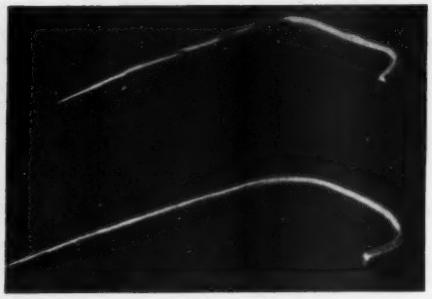


Fig. 6

grit wears down. Various grades of grit may be applied to its face. Finish polishing the weeder on a canvas buffer, using a buffing compound. Wear safety goggles during all grinding, polishing, and buffing operations.

Figure 4 shows planting tools made from a piece of ½-in. black iron pipe and from a piece of ½-in. conduit. To make this tool, a V 1 in. long is cut on each side of the pipe with a hack saw. Then the remaining points are hammered together so that the tool point is in line with the center of the pipe or conduit. An oxyacetylene welding torch or an arc welder is used to build up a solid point. (If welding equipment is not available the points may be left unwelded.) Grind off excess metal so as to make a round point; reheat and case-harden the point in a commercial casehardening compound. Heat the pipe or conduit at the mark for bending the handle, and bend as shown in Figure 5. Round off the end of the handle and polish the tool.

Figures 6 and 7 show a planting tool made from pieces of ½ and ¾-in. round rod. Square and hexagon stock may also be used. In drawing the points on round rods the metal should be forged down square to the required size and then rounded up. Otherwise, the bar is liable to split through the center. Case-harden the point, bend the handle, round off the end, and polish the tool, being careful not to cut through the casehardening at the point.

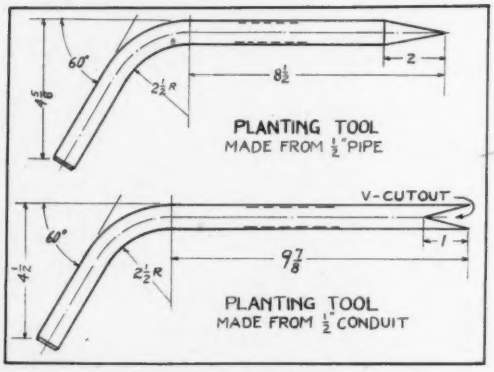


Fig. 5

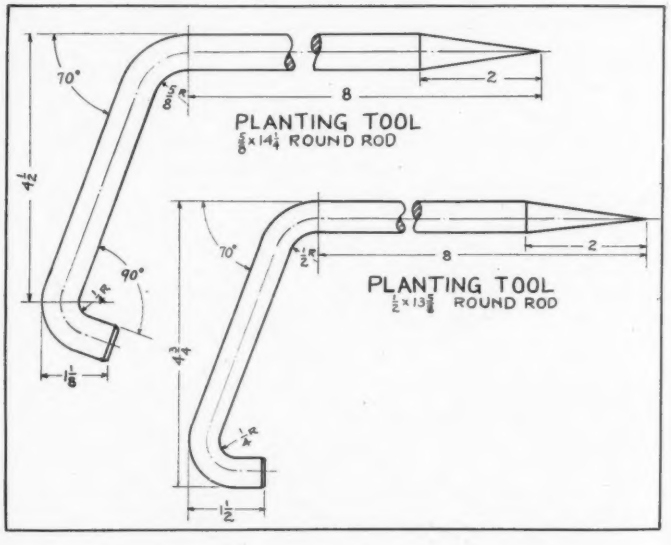


Fig. 7

WORLD WAR TANK

JAMES McGREGOR

Pasadena, Calif.

Worthy of note is the fact that this is a model of one of the first mechanized tanks used in warfare. The tank is the cavalry of the twentieth century. It is like a coat of armor built around man to protect him from all the deadly and develish weapons of modern warfare.

This is a simple project, and need not present much difficulty to young boys, and in addition makes a useful and ornamental container keyed to the times.

Pine, sugar or white, or other softwood that is easily worked is recommended.

In making the sides, a good point to start, the end bevels can be marked and sawn off on the waste side of the lines. Here there is a good chance for a boy to learn oblique planing. The marvel taking place on a piece of wood when planed with a sharp well set plane, showing up the beauty of the silky grain in pine or spruce, is something at which boys are always awed. Curved contours can then be jig-sawed and smoothed with file and sandpaper.

The box container compartment can then be made and fastened to the sides. Parts marked No. 3 may be left off if desired, but these do add to the more finished and life-like appearance of the tank. Here there is a chance to teach beveled edge planing. The lid No. 4 should be carefully fitted to slide easily but snugly into place.

them together on a lathe faceplate. Apply a coat of wood glue to the face of the canvas and then roll the wet wheel in emery grit. After the glue dries you can rough polish on this buffer, and it can be reset each time the

Painting or finishing can be varied to suit the boy's taste or ability. A dull gray green to resemble the color of the earth makes a good over-all finish. Camouflage may also be introduced, drawing irregular patches in tri-

angular, circular, oblong, and curved shapes, using a variety of colors to fill in the patches.

List of Material

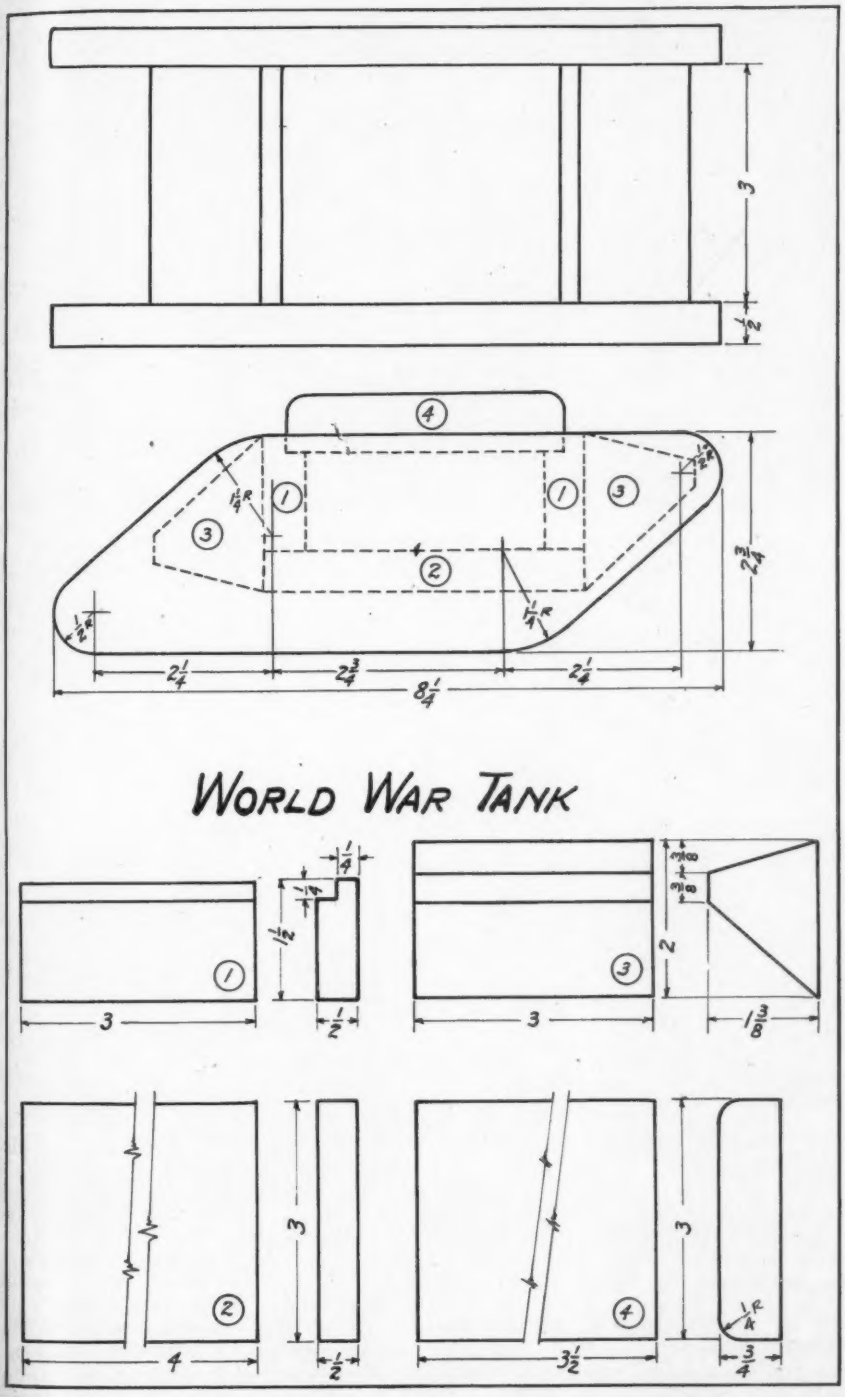
No. of pieces	*Size*	*Name*
2	½ x 2¾ x 8¼	Sides
2	½ x 1½ x 3	Compartment
1	½ x 3 x 4	Compartment
2	1⅜ x 2 x 3	Front and rear
1	¾ x 3 x 3½	Lid

BY-PRODUCTS OF TEACHER-BUILT PROJECTS

Harry Pederson* and Homer C. Rose**

How can the teacher develop his philosophy, improve his skills, and advance his technical knowledge? There is one sure way — by designing and constructing challenging projects. Many desirable outcomes result as natural by-products of skillful work with tools and materials. Let us examine the dividends paid on the work of building projects.

*Formerly of Faribault, Minn.
**On leave from Southern Illinois Normal University.



World war tank, submitted by James McGregor

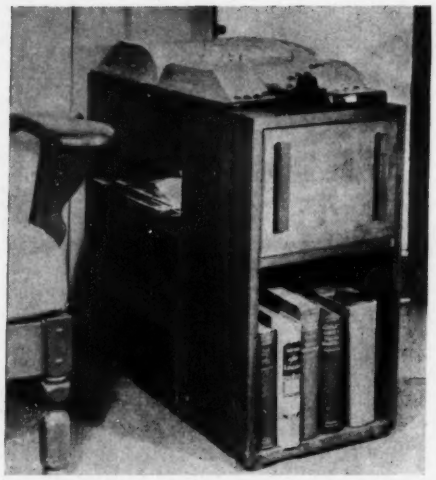
Helps the teacher to keep a learner's point of view. The teacher who is learning new skills will have less difficulty in understanding the problems, emotions, and attitudes of his students. There are too many hard-boiled teachers who have forgotten the real problems of all learners, because they have lost the learner's point of view. Since all learners feel emotions, a recent firsthand learning experience on the part of the teacher may enable him to deal more tactfully and understandingly with his students. A well-constructed challenging project may help the teacher to regain this attitude.

This iron and tile table shows the effect of careful design and workmanship

Develops present skills. Even the best students cannot hope to develop a high degree of skill during their college training. Much practice is necessary in the industrial arts before even a fair degree of skill is acquired. Teacher-training institutions do not claim to turn out finished craftsmen in all phases of industrial arts. They merely give a sound basis for the speed and accuracy that the graduate is expected to develop after he leaves school. The medical profession recognizes the limitations of mere college courses and requires graduates to serve an internship. Beyond that the medical profession expects its teachers to continue in the practice of medicine in order that their skills and judgments be kept at a high level.

Should not the shop teacher build new and difficult projects in order further to develop speed, accuracy, and confidence in the craft he teaches?

Develops new skills. We live in a changing industrial world where new technical processes are added almost daily. These changes come so fast that the engineer, the architect, the toolmaker must study and learn new skills if he is to hold his job. So also the teacher.



This modern end table is fine for a man who enjoys an evening of reading. Books, pencils, smoking accessories, magazines, dictionary and folders are always at hand

New materials, new tools, and different standards of workmanship require the addition of new skills. Then, too, new courses of study with a changed emphasis may require a different set of skills.

As an example: How many of us learned photography, metal spinning, spray painting, or plastic working in college? We cannot, however, shirk the responsibility of giving our students a well-rounded program on the grounds that we did not have training when we went to school.

It is dishonest to attempt teaching that which we ourselves cannot do or do not know. Should we not as teachers of technical subjects build such projects as will challenge our ingenuity and form a basis for learning new skill? Let's do a little *learning by doing* ourselves.

Gives chance to contribute technical information to professional colleagues. Industrial-arts teachers should strive to give to their profession new ideas, new designs, and different ways of doing the many things connected with shopwork. Think of the good likely to result if every instructor contributed one idea or design every year. We frequently hear instructors complain about lack of benefit received from attendance at conventions and meetings. It is probably true that we are shortchanged sometimes, but might not the fault lie with us?

In the past year have you contributed an idea to your professional magazine, to your state education journal, or to the paper put out by your sectional meeting? Have you given a positive suggestion to your fellow workers in your own school or to the instructors you have visited in surrounding towns?

Before and after. A fine example of what can be done for the school shop. An unsightly corner in the drafting room has become both useful and good looking

— Photo, courtesy of Mr. John Price, Milwaukee, Wis.

A home is a major project, the construction of which taught the teacher-builder much of many trades: carpentry, concrete and tile work, cabinet work, architecture, and design

— Design, courtesy of Industrial-Arts Department, Eastern Kentucky State Teachers College

This chest of drawers is an excellent project for the skilled craftsman. It involves inlaying, selection of pleasing woods and many woodworking operations

This wood carving is a real challenge. The skills learned may be used in other projects

It is possible to get ideas by just thinking, but if the instructor builds projects for the shop or for himself he is likely to get more and better ideas and, in addition, the ideas he has will be tested by practical application.

Stimulates creative ability. Progressive educators believe that the schools should develop the creative abilities of youth. In order to guide students toward this goal, the teacher must himself be a builder, an experimenter, and a creator.

Provides a sound basis for stating the philosophy of industrial education. We all listen with respect to the man who has had wide experience, and who can demonstrate well in his field. Let us imagine the instructor who has finished a fine piece of furniture, or is working on a design for a home, or is designing a special tool. Another teacher, tradesman, or parent comes into the shop. The skillful teacher, observing the interest shown in the project, may use the opportunity to point out the objectives of the course, the fine experience given youth of our day in the better industrial-arts shops. Is not such a teacher in a better position to sell industrial education than the man who never builds anything, who does not practice what he preaches?

Stimulates instructor to search for better, more modern tools and materials. Have you turned steel with tungsten carbide cutters?

How does hot animal hide glue compare with the newer plastic glues?

What abrasive shall I use for cutting aluminum?

New and better tools and materials are being sold. Perhaps there is a better finish for your projects. Maybe there is a process your students need to learn. Build a project. Use new materials and tools. Both you and your students will profit, and your department will see more of the industrial arts and less of manual training.

Then, too, the shop teacher who has at his command a full knowledge of major technical developments will more likely gain the respect of the industry in his area. This, in turn, may lead to a sounder, more understanding relationship between school and industry.

Sets high standards of accomplishment for students. One of the objectives of industrial arts is to develop in each pupil an appreciation of good workmanship and good design. Because of the limited time available to shop students, this objective is not likely to be fully achieved. The instructor who makes well-designed and well-constructed projects gives the learners a basis for comparing their work with his. Students will watch the progress of the teacher's work with great interest. The wise instructor will make use of this interest to point out specific elements of craftsmanship, such as tight-fitting joints, well-sanded surfaces, proper application of finishes and the like. This additional contact with well-executed techniques will aid in reaching our goal of appreciation of good workmanship.

Helps to sell idea of worthy accomplishment to students. The old expression that "Those who can, do; those who can't, teach" should not apply to industrial-arts teachers. How many teachers can turn out a professional project in three or four fields? Should they be able to do so? We believe they should. It is pointed out elsewhere in this article that the training one gets in college is not long enough to produce a first-class craftsman. This being true, it follows that each instructor must build projects for himself or the school so that his ability may be equal to the standard of professional workers. Students have confidence in an instructor who produces well-constructed and properly designed pieces of work with the standard tools and equipment.

This photo enlarger is a stimulating and practical project for the shop teacher. New skills in casting, spinning, and machining may be learned, and the finished project makes a fine addition to the photo laboratory of school or home

Leads to more functional arrangement of tools, equipment, and materials. Tools, equipment, and materials are arranged functionally when the movement of students is reduced to a minimum consistent with maximum safety. Every progressive instructor has given considerable thought to this problem. After teaching for some time, however, one might become accustomed to the existing setup, and be lulled into believing the present situation adequate.

When the teacher constructs a complete project in his school shop he may find that tools and materials, like drills and screws that often go together, are not conveniently arranged. Perhaps it is necessary for him to walk back of the circular saw on his way to get materials or tools. When using machines he may discover that they are not arranged logically for routing the materials or for best lighting.

Inefficient arrangement of shop equipment and tools must not be tolerated, and a good way to detect poor arrangement is to place oneself in the position of the learner.

Provides opportunity for relaxation from teaching. We are shop teachers, yet we suffer from the same emotional tension that characterizes the teaching profession. The personalities we deal with and the problems we face as teachers make our day a strenuous one.

A quiet hour with our good friends the tools may well serve to relax and refresh us. A little physical work in building a useful project may use as many muscles and give as healthy exercise as a game of golf or a set of tennis.

We often recommend the home workshop to those in other professions as a means of recreation, exercise, and expression. We, too, should follow this good advice.

BUSHEL CRATE AND CRATE ASSEMBLING STAND

LOUIS M. ROEHL
Department of Agricultural Engineering
Cornell University
Ithaca, N. Y.

A bushel contains 2688 cu. in. A bushel crate, such as the one shown in Figure 1, is one type of crate commonly called *field crate*. This shape permits *stacking*, that is, one crate may be stood on end in another and a third placed upside down on the other two, thus minimizing storage space.

The kind of wood to use depends largely on what is available. Hardwood is better than softwood for the corner posts because it holds nails better. Elm is extensively used. Making these posts triangular in shape makes smooth corners and helps prevent bruising the contents of the crate.

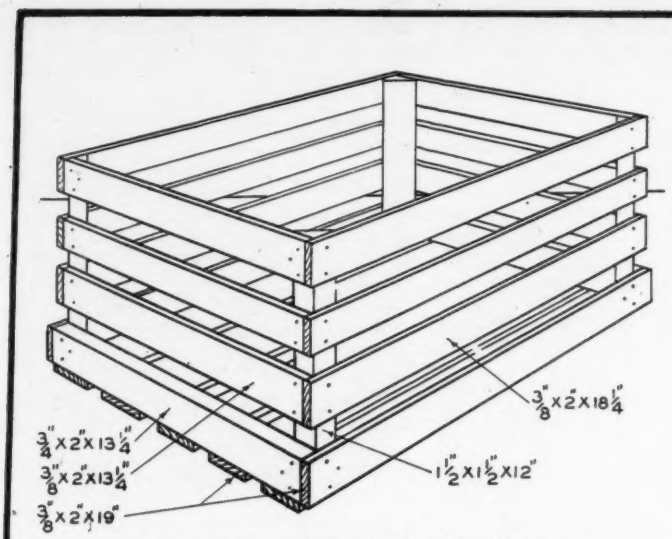


FIG. 1, BUSHEL CRATE, 2688 CUBIC INCHES

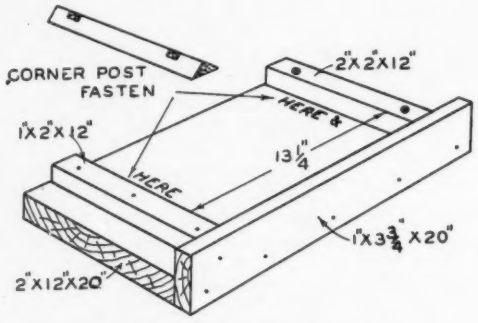


FIG. 2 CRATE END ASSEMBLING JIG

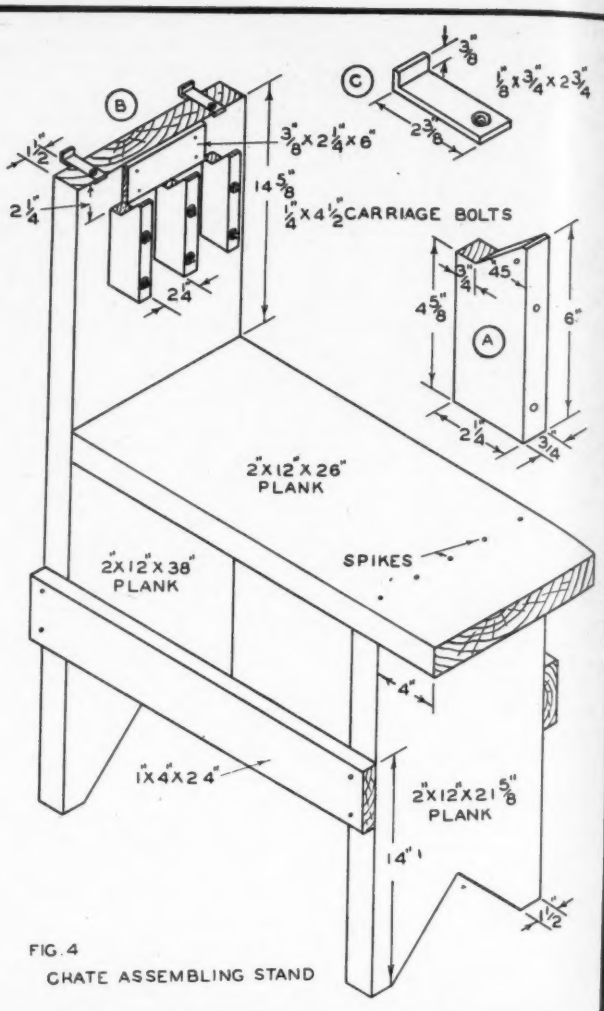


FIG. 4
CRATE ASSEMBLING STAND

Fig. 1. Bushel crate — Fig. 2. End assembling jig — Fig. 4. Crate assembling stand

Softwood is used for the slats. Basswood is used if available because it is light and strong and holds nails well. Material 3/8 by 2 in. is recommended. The bottom end slat is 3/4 in. thick so as to give a good nailing surface for the bottom slats. Two penny box nails are used for the 3/8-in. slats and three penny for the 3/4-in. slat.

Success in assembling crates depends on a support or stand to hold the pieces in place while nailing. Figure 2 shows an assembling jig for nailing the ends. A board 1 by 3 3/4 in. is nailed to one edge of a 2 by 12 by 20-in. plank. Two pieces are nailed across the plank 13 1/4 in. apart — one piece 2 by 2 by 12 in., and the other 1 by 2 by 12 in. Two of the corner posts are then fastened to the plank with screws close to the other crosspieces respectively as illustrated in Figures 2 and 3. To assemble an end, two corner posts are placed in the triangular places on the jig as illustrated in Figure 3. The 3/4 by 2 by 13 1/4-in. piece, which is the bottom endpiece,

Fig. 3. Assembling an end

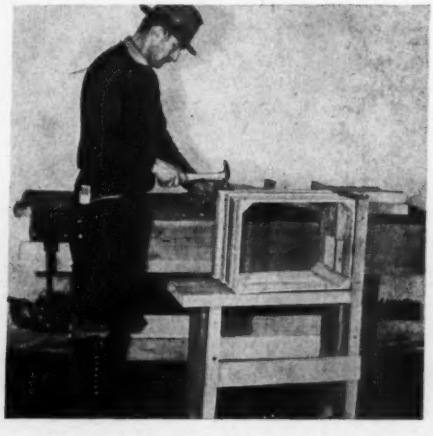


Fig. 5. Nailing on the side slats

Fig. 6. Nailing on the bottom slats

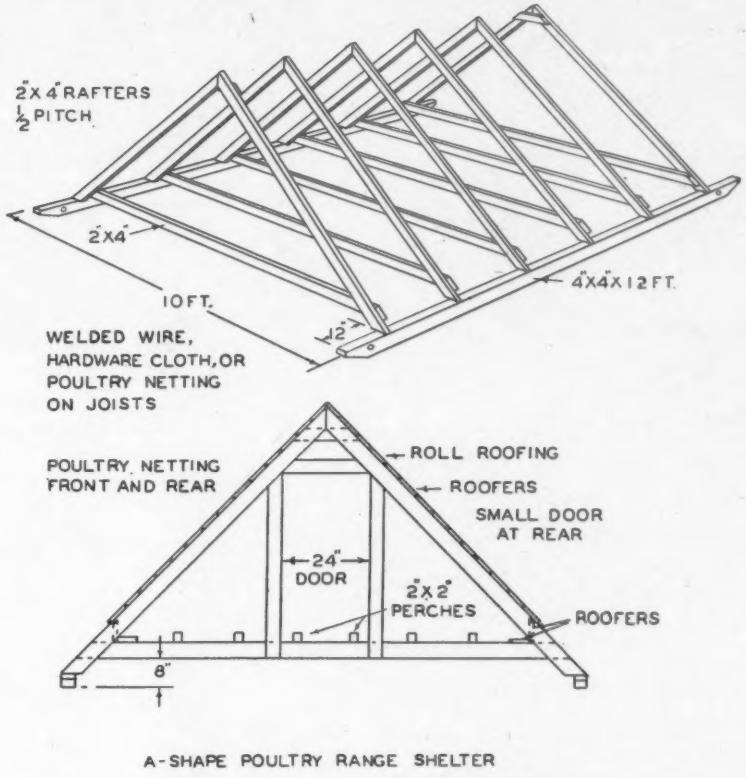
is then placed on it against the sideboard and the 2 by 2-in. piece, and nailed to the triangular posts. The other slats are then likewise nailed in place. Three nails are used for each joint.

For assembling the sides and bottom, the crate assembling stand, Figure 4, is used. The framework of the stand is made of a 12-in. plank. The main upright piece is 2 by 12 by 38 in., the horizontal member is 2 by 12 by 26 in., and the supporting post is 2 by 12 by 21⅝ in. A 1 by 4 by 24-in. board is nailed at each side, 14 in. from the bottom, to brace the frame. The frame may be assembled with spikes or flathead wood screws. Three hardwood pieces are made as shown at A. These are bolted to the main upright member of the stand with ¼ by 5-in. carriage bolts as shown in Figure 4. A ⅜ by 2¼ by 6-in. block is nailed to the plank immediately above the hardwood pieces for the ends of slats to butt against when they have been nailed in place. Two metal hooks are made of ⅛ by ¾-in. iron as shown at C. These are set in flush at the top end of the post as shown at B.

To nail on the side slats one assembled end is placed on the three hardwood blocks and another assembled end is placed on the platform as illustrated in Figure 5 and the slats of one side are nailed in place. The crate is then turned upside down and the slats of the opposite side are similarly fastened.

To nail on the bottom slats the crate is placed on the post as shown in Figure 6. The ¾-in. bottom end slat resting on the post makes a firm nailing surface.

It may be noted in the illustrations that the workman has placed the nails in a shallow pan and the slats on a pile at his left so as to eliminate lost time and motion.



A-SHAPE POULTRY RANGE SHELTER

Fig. 1. A-shape poultry range shelter

POULTRY SHELTERS

LOUIS M. ROEHL
Cornell University
Ithaca, N. Y.

A-Shape Poultry Range Shelter

The A-shape poultry range shelter, shown in Figure 1, is inexpensive, simple in construction, and satisfactory in service. If straight poles are available, they may be used for skids instead of the 4 by 6-in. timbers. Placing the joists 4 in. above the skids keeps them clear of uneven ground when the shelter is dragged to new locations on the lot. Two by fours are suggested for rafters and joists if the shelter is built to the dimensions in the drawing. Allowing 6-in. perch space per bird this size will shelter 120 birds. If it is made smaller, 1 by 4-in. material may do. Two roofers are placed at the sides of the shelter. The welded wire, hardware cloth, or poultry netting is placed on the joists and one board at each side. The upright roofer encloses the shelter at the sides. Then the 2 by 2 in. by 10-ft. pieces are placed on the wire floor for roosts as indicated. The rafters are covered with roofers and roll roofing. In addition to the 2-ft. door at the front, some poultrymen place a small door for the poultry at the rear.

The front and rear of the shelter are covered with poultry netting. If this is not available, lath or ¾ by 1-in. wood strips may be used. Wood strips are also satisfactory on the joists if wire is not to be had.

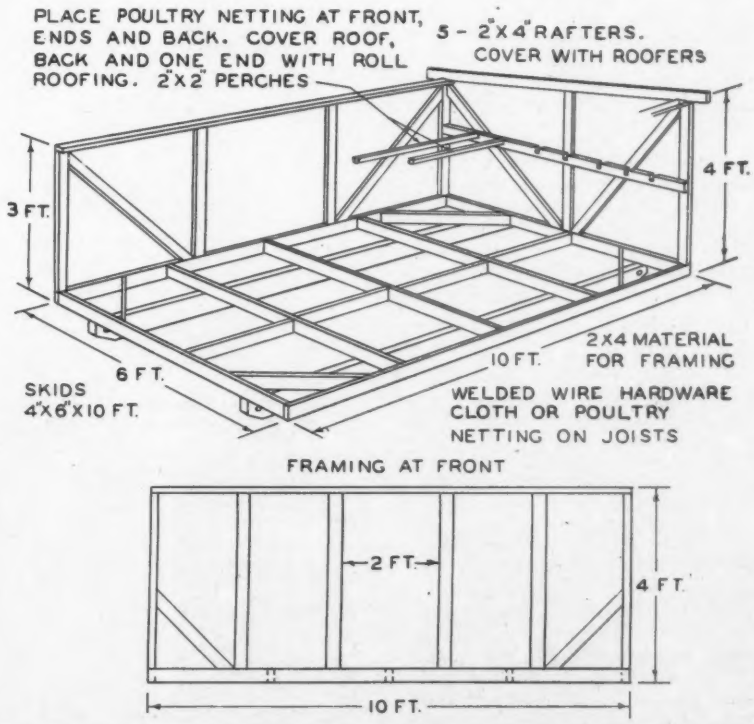

PLACE POULTRY NETTING AT FRONT, ENDS AND BACK. COVER ROOF, BACK AND ONE END WITH ROLL ROOFING. 2"X2" PERCHES
5 - 2"X4" RAFTERS. COVER WITH ROOFERS
4 FT.
3 FT.
2X4 MATERIAL FOR FRAMING
10 FT.
6 FT.
SKIDS 4"X6"X10 FT.
WELDED WIRE HARDWARE CLOTH OR POULTRY NETTING ON JOISTS
FRAMING AT FRONT
2 FT.
4 FT.
10 FT.

Fig. 2. Shed-roof poultry range shelter

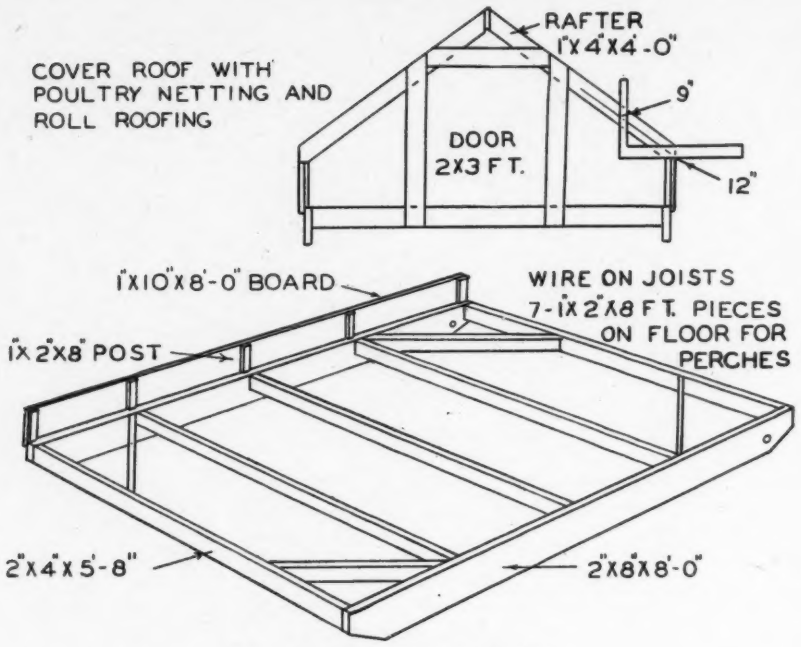


Fig. 3. Poultry range shelter

Shed-Roof Poultry Range Shelter

The framework of the shed-roof poultry range shelter is made of 2 by 4-in. material. The skids are 4 by 6 in. by 10 ft. Unsurfaced lumber of the same or other dimensions may be used if a poultry farmer has it at hand. Logs serve equally well as skids. Since a poultry shelter is frequently dragged to different locations on the range it is highly desirable that the frame be well braced as indicated in Figure 2. The joists are covered with welded wire, hardware cloth or poultry netting. Welded wire 1 by 2-in. mesh is considered best by many poultrymen. If wire is not available, 1-in. slats sawed from 1-in. lumber is a good substitute for both floor and walls. The walls are covered with poultry netting, though lath or 1-in. slats may be used if wire is not available. Seven perches of 2 by 2-in. material are placed at 2 ft. from the floor. Some poultrymen, instead of using perches the full length of the building prefer to place two supports across the structure and use shorter perches, leaving a space at center of at least a foot to provide space for a man to get in and about the roosts.

Five 2 by 4-in. rafters support common roofers which are covered with roll roofing. Many poultrymen choose to cover the back and one end with roll roofing as a windbreak for the fowl.

Usually 6 in. of perch space is allowed for each bird, hence, this size of shelter will care for a flock of 150 birds.

Lightweight Poultry Range Shelter

A satisfactory poultry range shelter can be made of old lumber too poor to use for other structures. Sizes called for in the plan, shown in Figure 3, may be changed to suit lumber at hand. This construction is especially suitable for a small flock of birds. The shelter is light, inexpensive, and easy to build. Welded wire or poultry netting is placed on the joists, and 1 by 2-in. slats are used on the floor for perches. A 10-in. board is nailed to the skids at each side. This raises the roof at the eaves and allows full use of the floor for roosting. It also serves as a windbreak and rafter support. Boards 1 by 4-in. are used for rafters. Instead of roofers, poultry netting is strung over the rafters and nailed to the 10-in. boards. This provides support for the roll roofing which is nailed to the rafters.

A doorway is framed at the front end large enough to admit a man. Some poultrymen may desire to construct a small poultry door at the rear. Front and back of the shelter are covered with poultry netting.

DEVELOPED LENGTH FORMULA

K. H. CZIRR
High School
Closter, N. J.

It is often necessary to compute the developed length or *stretchout* of a bent piece such as is shown in Figure 1. This is becoming increasingly true in aeronautical design where the proportion of formed pieces to castings, forgings, and rolled shapes is greater than in most heavy construction.

It must be understood, of course, that the rule given here is not absolutely infallible, as its accuracy can be affected both by hardness of material and method of forming. Therefore, it is wise for the draftsman to indicate that the result is approximate.

The straight parts are, of course, measured along the center of the section as at *S*. When the inside radius of the bend is equal to, or greater than twice the thickness of the material, the length of this part is measured along the center of the material as at *E* and *G*. When the inside radius is *less* than twice the thickness of the material, calculate its length as being equal to a line whose radius equals the inside radius *plus* 1/3 the thickness of the section as at *L*.

Note: *E*, *G*, and *L* must be computed arithmetically as fractional circumferences and in thousandths of an inch. They should not be measured by spacing with dividers, as this would give chordal distances, and consequently be incorrect.

Problem: Redraw the views of the bracket shown in Figure 2, and find its developed length. Show the holes in the stretchout but dimension only its length as you have calculated it.

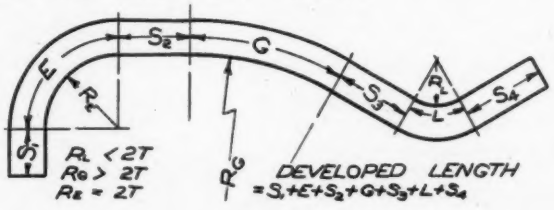


Fig. 1

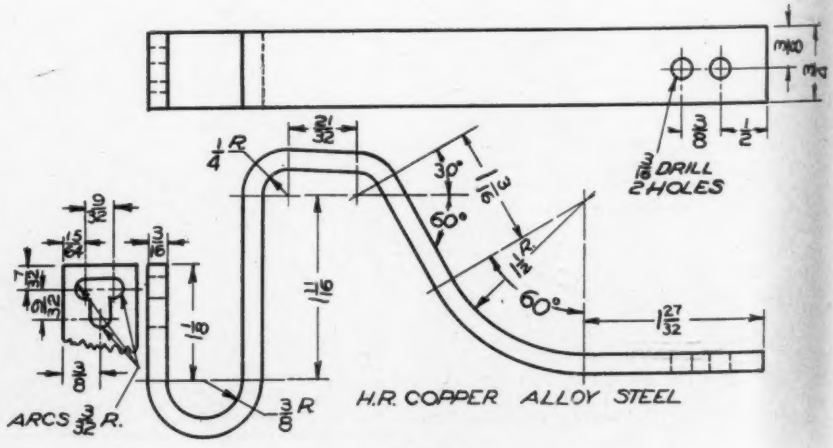


Fig. 2

WHITTLING-JACKKNIFE TECHNIQUE

W. BEN. HUNT
Hales Corners, Wis.

(Continued from page 20A of the May, 1943, issue)

Ducks

For Wall Decorations or Lapel Pins

The whittling project shown in Figure 123 will be very interesting to duck hunters. Although only three pairs of ducks are shown, each pair may be colored in a different way so as to represent a flock of various kinds. It was impossible to show colors, but it is suggested that the whittler go to the library or look in his or her books of birds for the coloring. Use water colors and a couple of coats of clear lacquer (clear fingernail polish), for finishing. All the ducks shown are whittled half in relief and half in the round, one flat side being left for the wall side.

Study Figures 124, 125, 126, 127, and 128 before starting to whittle. Figure 124 shows progressive steps from silhouette to sanded finish. Figure 125 shows all the ducks after being sanded. All feathers should be shown with rather fine *V* cuts. In making the male green-winged teal A, be sure to flatten the back of the duck as shown in Figures 124 and 126. This gives the duck a better perspective. If the back is not flattened, the bird will appear as if it were flying by flapping its wings alternately.

Figure 123 shows how a flock of whittled ducks may be hung on a wall. For lapel pins, the ducks should be made about 2/3 the size shown in Figures 126, 127, and 128. A razor-sharp, thin-bladed knife is required for cutting out between the wings, as this means cutting directly against the grain. Both of the ducks shown at *C* and *E* especially require this cutting out between the wings.

Basswood or birch should be used for these ducks as too soft a wood will be likely to crack at the ends of the feathers. Since these ducks are usually viewed from straight on, a certain amount of thickness may be allowed in the wings and wing feathers. The grain of the wood should run the long way, although if birch is used, it will not matter much which way the grain runs. See pp. 256, 257, and 258.

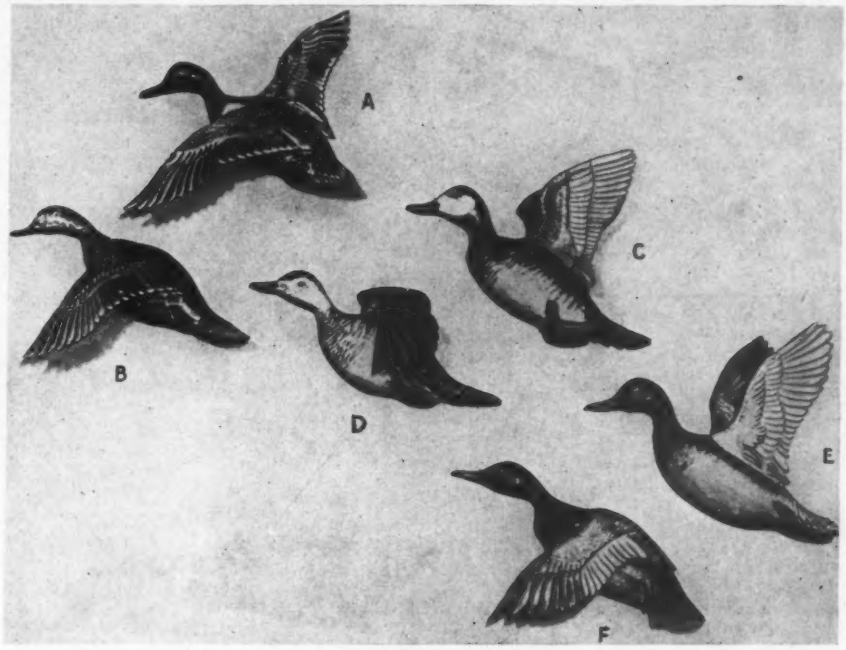


Fig. 123. The entire flock

Fig. 124. From silhouette to finished duck

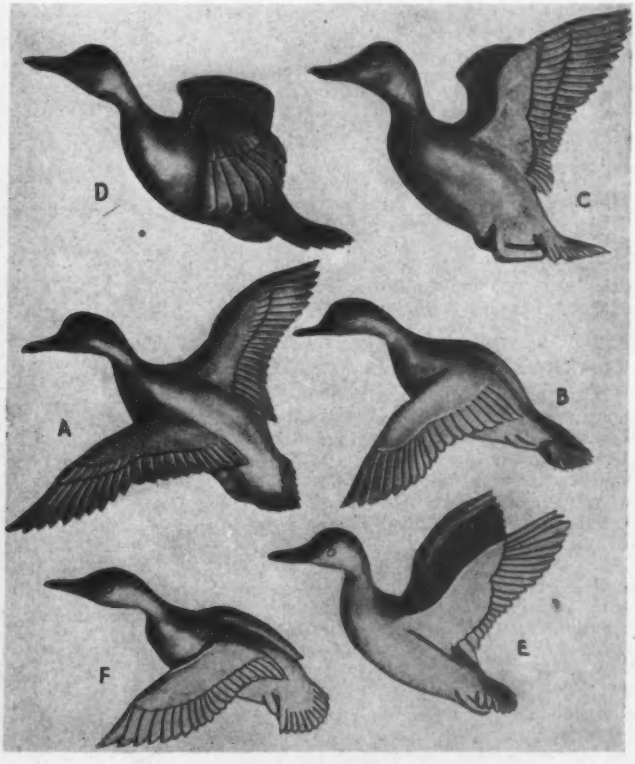


Fig. 125. The ducks ready for their colors

THE WHY OF WAR-PLANT SHUTDOWNS

Mr. Fisher of the Fisher Body Division, General Motors Corp., Detroit, Mich., recently made the following statement:

"There have occurred in this and other of our plants what may have appeared to you to be inexcusable interruptions of work. It certainly does not appear on the surface to be efficient operation when we work long hours of overtime, and on Sundays and holidays, and then close down for a day or two waiting for materials or necessary tool changes. Unless all the facts are known, these constant face-abouts may easily be interpreted as managerial blunders, poor planning, or even governmental inefficiency.

"But we cannot operate, in war, on the 'steady flow' basis to which we were accustomed in peacetime.

"Frequently enginering changes are required immediately to meet the continually changing conditions on the fighting fronts. Frequently materials must be quickly transferred to other — and for the time being — more important projects. Sometimes schedule changes must be made in the middle of a day's production to meet an emergency requirement.

"That is war. That is what we are all up against. But let us remember that the soldiers at the front cannot wait. When the boys in the foxholes are running low on munitions they can't take a few days off to wait for more. They must fire every gun as long as it will fire.

"That is exactly what we on the production front must do — work to our utmost each day with all the resources at our command. Material shortage may have handicapped us yesterday; tomorrow the government might find it necessary to alter our entire program. Nevertheless, our job today is to be on the job, producing all we can the best we know how.

"That is wartime efficiency. It is radically different from the accepted standard of peacetime efficiency. Regardless of the consequences, we must gear our production to the ever changing requirements of the men at the front — not to the convenience of those of us working safely at home."

This statement may well be brought to every trainee who will later be engaged in war-production factories. A knowledge of why the seemingly erratic production interruptions occur may help him keep up his morale.

SAVING VALUABLE ALLOYS

Critical alloys may be saved by increased emphasis on tool conservation throughout the metalworking industry. To accomplish this, Howard Coonley, director of the WPB Conservation Division, recommends that each production plant make a study of its tool-handling problems and adopt a company-wide tool care policy.

Such a policy would require a strong tool-handling educational plan in the training program for new employees. The necessity for training in tool care is becoming increasingly important as more and more *green* employees come on the job.

Many of the factors that result in tool breakage and spoilage are elementary in nature, and can easily be avoided if clearly explained to workers. In handling twist drills, for instance, the tight clamping of the parts

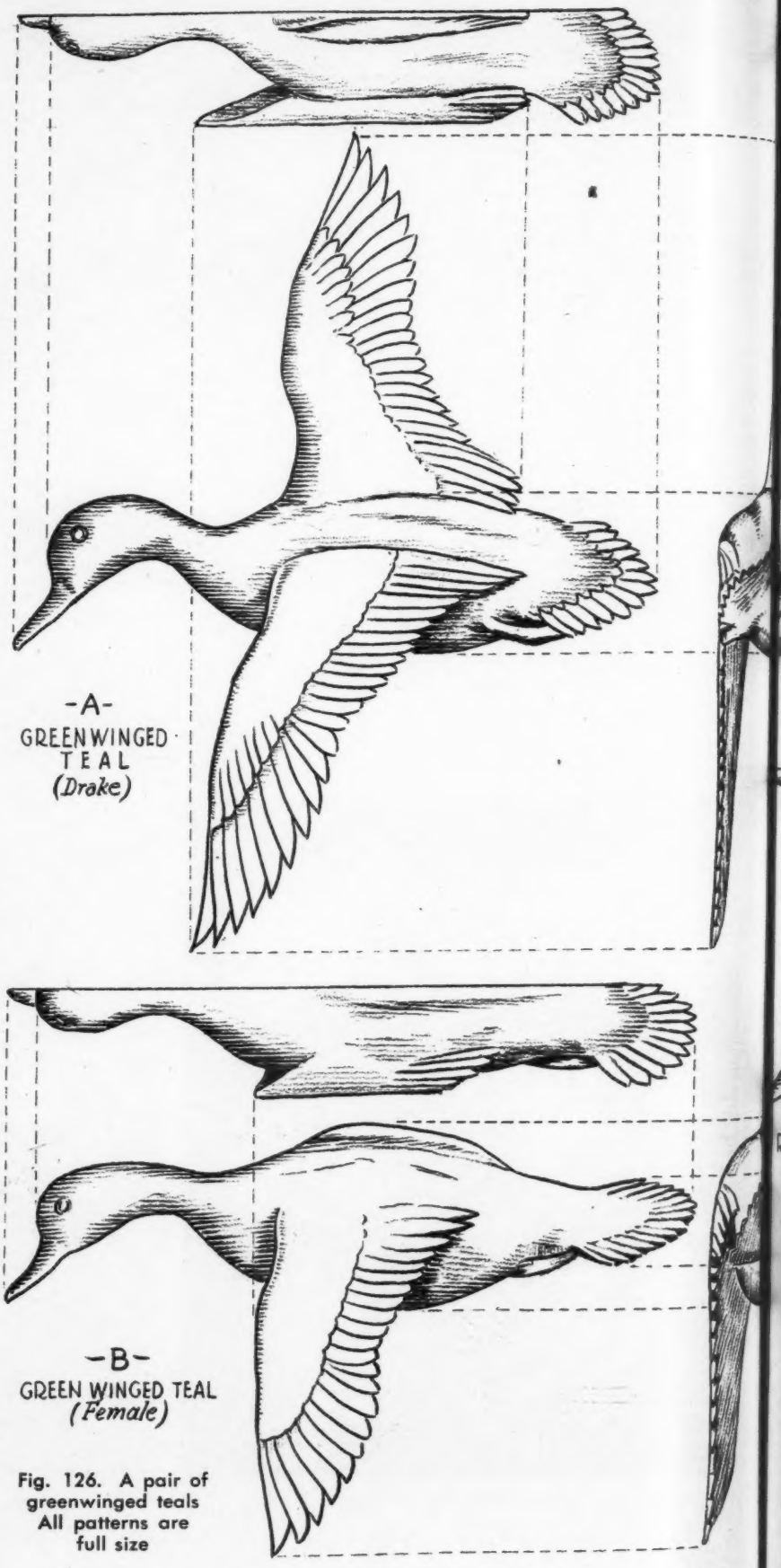


Fig. 126. A pair of greenwinged teals All patterns are full size

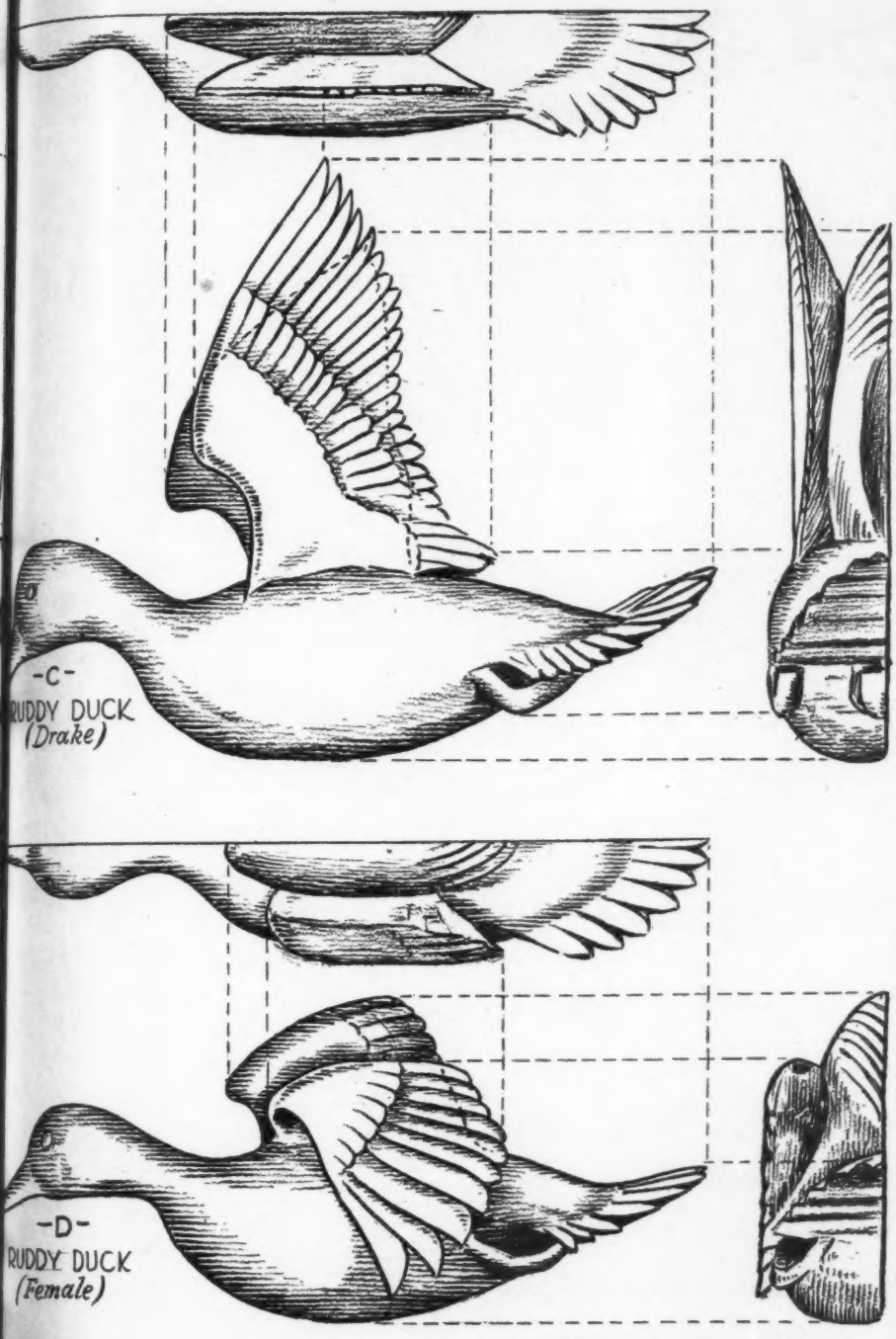


Fig. 127. A pair of ruddy ducks

to be drilled will help insure against uneven stress being placed upon the drill. A few extra seconds taken in *tightening* will keep an expensive drill in active service longer.

When there is breakage, broken tools can often be reclaimed. They can be cut up into smaller pieces that are used as cutting tips, brazed into shanks made of nonalloyed steel, thus conserving the critical alloyed steels that would otherwise be required. This is a practice that has been adopted already by many plants and can be readily handled by many more. High-speed tool steels contain approximately 20 per cent of the following highly critical alloying metals: tungsten, molybdenum, vanadium, chromium, and cobalt.

Widespread adoption of tool-tipping practices could mean a saving of 75 per cent of the 36,000 tons of *tippable* tools estimated as being needed in 1943. The cutting tool is actually the fulcrum of most war industry, as cutting tools of one type or another are used in processing most metal parts for the machinery of war.

HELP WANTED

In the belief that there is a need for a book of lesson plans for the printing trade, and feeling that the printing teachers might be interested in the preparation of such a book, I am making an appeal to all of these teachers to take part in the venture.

Each teacher participating would send his idea of a lesson plan for the first year of printing. The items listed by the majority would then be incorporated into a *master* lesson plan. Printed copies of this plan would be sent to each instructor along with enough lesson plan sheets to cover each item.

The teachers would then make a plan for each lesson listed, and again the points considered most important by the majority would be incorporated into master lesson plans. Printed copies of each master lesson plan would be sent to each one taking part. In the end, each teacher would have a book of lesson plans for the first year of printing on 8½ by 11-in. sheets. There would be no charge of any kind for the sheets or plans.

Those interested will please send their outline to Leonard E. Schmidt, Lincoln Hall Vocational Shops, Lincolndale, N. Y. Your cooperation will be appreciated.

IF YOU HAVE ARC WELDING IN YOUR SCHOOL

The American Welding Society recommends the following *Safety Rules for Student Arc Welding Operators:*

1. Wearing proper shoes and clothing.
2. Using a helmet or shield, in good condition, when in the vicinity of an electric arc.
3. Providing adequate ventilation for all welding operations..
4. Making provision for venting exhaust gases when operating gasoline-driven welding machines in confined spaces.
5. Wearing goggles when chipping, grinding, or removing slag.
6. Removing combustible materials from the vicinity of welding or cutting operations.
7. Taking proper precautions before welding or cutting containers which have held combustibles.
8. Striking an arc only on the work to be welded.
9. Avoiding bodily contact with "live" electric circuits.
10. Preventing the electrode holder from becoming grounded.
11. Observing that cable connections are tight and that cables do not become hot.

— *Code of Minimum Requirements for Instruction of Welding Operators*

TECHNIQUES IN USING THE BAND SAW

JOHN MC INNES
Public Schools
Montesano, Wash.

Names of Parts of Band Saw

1. Upper wheel guard
2. Sliding guard
3. Guide post
4. Lower wheel guard
5. Arm
6. Tension adjuster
7. Wheel tilt adjuster
8. Table
9. Blade slot
10. Miter gauge groove
11. Table clamp
12. Table tilt attachment
13. Ripping guide
14. Guide bracket — upper
15. Guide pins — upper
16. Guide bracket — lower
17. Guide pins — lower
18. Ball-bearing blade support — upper
19. Ball-bearing blade support — lower
20. Guide slide adjusting nuts
21. Belt guard
22. Motor
23. Pulleys

Ripping With Band Saw

1. Set upper guide so that it will be about ⅛ in. above highest part of stock.
2. If stock is round or irregular in section, so that it does not rest firmly on the table, do not cut it without some kind of a jig to hold it in place.
3. Guide the stock by placing the left hand on the table opposite the saw and use the right hand to put the stock into the saw. Care should be taken not to get the hand closer than four inches from the saw. For remainder of cut use scrap piece of wood or push stick.
4. Ripping guide may be used. As with any saw — take care to keep hands clear of saw.

Crosscutting With Band Saw

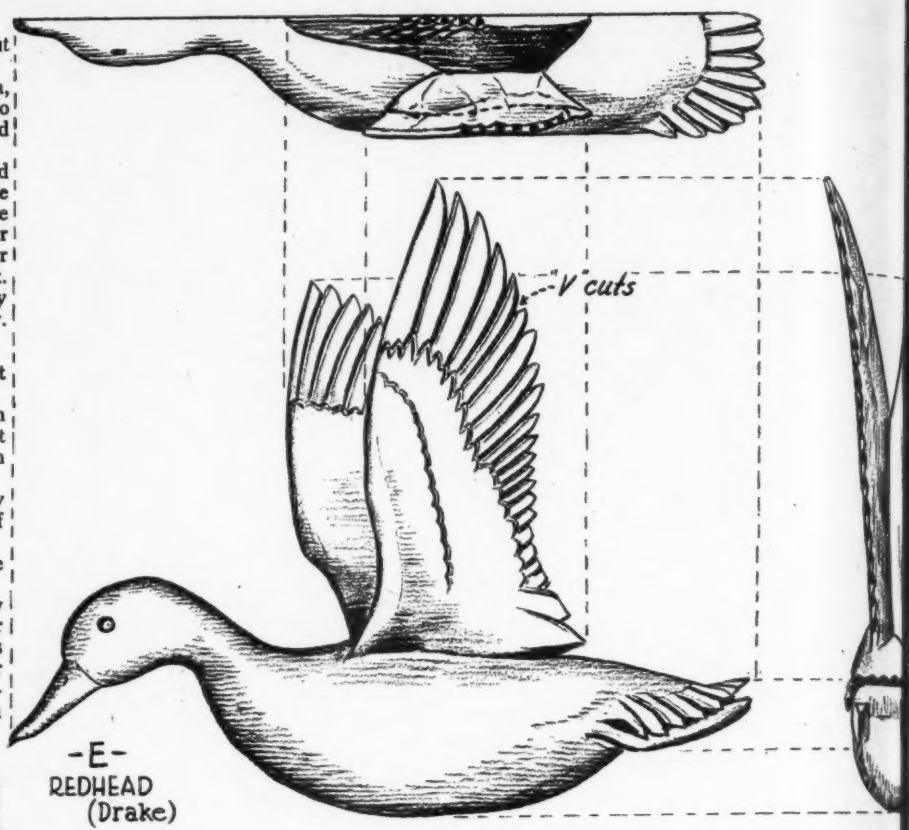
1. Set upper guide so that it will be about ⅛ in. above highest part of stock.
2. If stock is round or irregular in section so that it does not rest firmly on table, do not cut it without some kind of jig to hold it in place.
3. Hold stock so that hands are widely enough separated to avoid any chance of danger from saw.
4. Miter attachment may be used to give any desired angle.
5. In both ripping and crosscutting the saw blade has a tendency to creep to one side or the other unless it is sharpened perfectly. This creeping makes the ripping attachment or miter attachment worthless until saw is properly sharpened but does no particular harm if guided by hand.

Jigs

1. Circles may be cut by making jig with a center directly opposite the cutting edge of the saw and revolving stock around this center.
2. Round stock may be cut in a *V* shaped jig.
3. A *V* shaped jig may be used in centering square stock for the lathe.
4. Special cuts may be accomplished by devising a jig to suit the job and clamping it to the saw table.

Cutting Curves

1. Use a blade that will follow the desired curve if possible — the narrower the blade, the smaller the radius of the curve you can cut.
2. If curve is too sharp, rough cut in the waste stock to approximately the correct cut, make a series of cuts perpendicular to the line in the waste stock, and then cut along the line. As each of the perpendicular cuts is reached, the stock will drop away leaving room enough to turn the blade.
3. By drilling holes at the corners to make a place to turn, difficult cuts are simplified.
4. Make all short cuts first.
5. Take care before starting cut to start from a position that will allow work to turn without bumping arm.
6. If a point is reached where it is impossible to go any farther without cutting finish stock, stop the saw and back out of the cut.



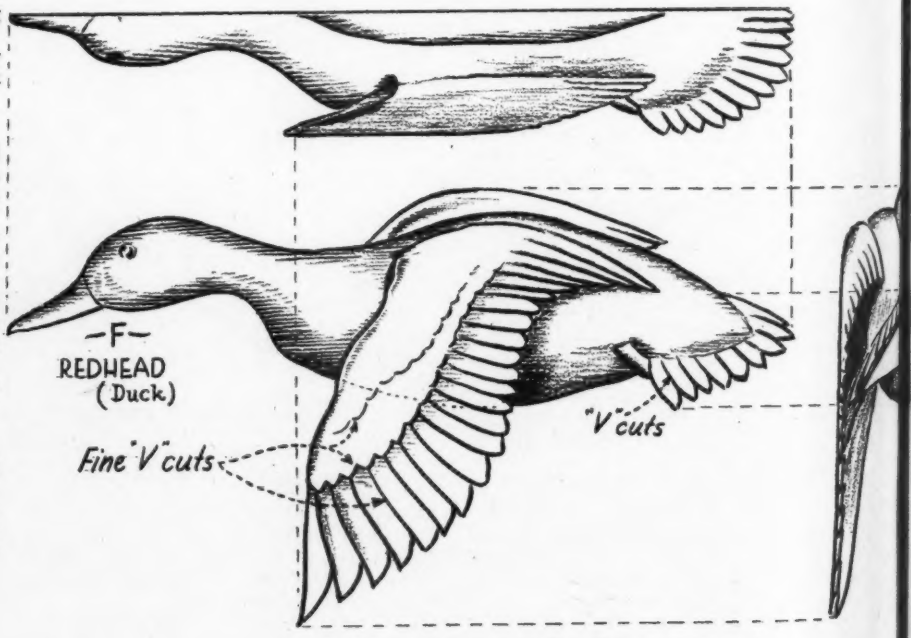


Fig. 128. A pair of readheads

TEACHING AIDS IN THE GENERAL SHOP

ORLANDO B. LITTLE
Indianapolis, Ind.

With the development, in recent years, of the general shop, where arrangements for a variety of activities are made, certain teaching problems have bothered instructors who have previously been teaching only one form of shop activity at a time. The writer of this article was no exception to the rule, but necessity, being the mother of invention, caused him to develop certain teaching aids which have made the teaching in the general shop more effective.

In the general shops in the junior high

schools of Indianapolis, five subjects are taught each term. The first three weeks of each semester are devoted to mechanical drawing, after which time the classes are divided into sections. Each section is assigned a definite allotment of time in each of four subjects, the following being one semester's schedule: woodwork, printing, electricity, and sheet-metal work.

A movable desk, which is the *teaching center* around which the teaching activity revolves, was developed from the necessities of the situation. It is not a plan developed on paper but has been in actual operation over a period of several years. This desk, Figure 1, was designed small to permit its being moved around to any position in the shop where the teacher's attention is needed the most during any particular period. For example, during a period when a lesson has been given on dumping the printing stick and tying type, this desk can be located near the imposing stone where it is apparent that a great deal of time will be required for that period. If soldering is being done for the first time, the desk can be rolled near the soldering bench so that the teacher can give the closest supervision to that phase of the work, while not neglecting the other activities in the shop.

The top of this desk is used for the roll book or progress charts, whichever are being used. The desk is pulpit high, permitting the teacher, without stooping over, to mark a proof in printing or to enter a grade on the chart, and at the same time enabling him to keep his eye on the class during the time he is engaged in this clerical phase of his work. It is not intended to suggest by any means that the teacher remains in front of this desk, but it has proved handy when duties come up involving its use.

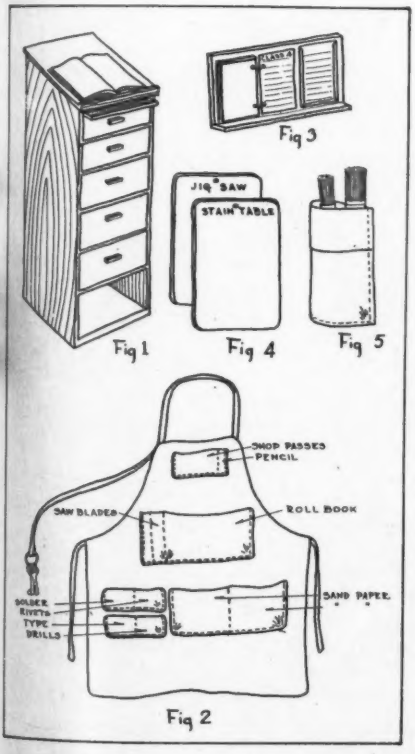
The second purpose of the desk is storage for small supplies, patterns, designs, etc., over which the instructor wishes to keep special control. The top drawer is very shallow and is used for keeping special class record cards. The second drawer has a lock on it and is divided into a number of small compartments. In these are kept blanks for plastic rings and other items which are not among the regular supplies furnished by the school and which must be paid for by the pupils.

The third drawer from the top is used for filing printing proofs as they are graded and recorded. The fourth drawer is used for keeping special patterns for small projects used to fill in the few periods which often intervene between the time when a boy finishes his woodwork project and will go into printing or some other subject within a few days. The bottom drawer is a file for class printing projects, drawings of work in progress, and files of designs and *ideas* to aid in helping the boy select the problem he is going to make next. This desk, it will be seen, is actually the equal of an assistant teacher or helper.

As has been indicated in the preceding paragraphs, the desk illustrated was designed to enable the teacher to maintain close supervision over all of the activities which are being carried on at one time. The apron shown in Figure 2 was designed to carry this idea still further. Obviously, it is impossible to follow all of the operations of each member of the class on every project of the four subjects being taught, so some kind of check must be made after certain operations before the next is started. This is best done by controlling the distribution of materials and supplies. The apron is an important aid in keeping this material always within reach, as each pocket is designed for a very special use.

If sandpaper is left in a place available to everybody, boys will invariably start to sandpaper long before the project is ready for it. By giving out the sandpaper as it is needed, the teacher can inspect the project and give his approval before the work of sanding is started. A special pocket has therefore been planned for sandpaper. There are many other phases of the work which can be controlled in a similar way. While the boys in woodworking are generally required to remain at their benches when their work is ready to be checked, printers are permitted to come up to the instructor, wherever he may be, to have their lines of composition checked or to show that they are holding a line of type properly for distributing, so it is convenient to have close by a pocket for printing proofs from which they can be removed when back at the teaching center desk.

In the pocket labeled solder, short pieces



SHOP PASS

_____ Date

_____ has my permission

to work in the shop from _____ to _____

_____ if you will excuse him

_____

_____ Room Teacher

_____ Parent's Signature

Brush Check

Shellac Brush ____

Enamel Brush ____

Stain Brush ____

_____ Name

Class 3 Sec. 1

Don Cole
Forrest Carter
Jimmy Cook
Monte Moulton
James Dawson
Robert Gourly
Ray Hale

Wood Work

1 Saw Rack
2 Short Stock
3 Stain Table
4 Nails & Screws
5 Locker
6 Tool Panel
7
8

Fig. 6

or pellets of wire solder are kept. When a piece of metalwork is ready for soldering, the student brings his work to the teacher. Generally a glance will tell whether the proper preparation has been made. If the work is acceptable he can place one, two, or more pellets of solder, just enough for the job, in the boy's hand, often without interrupting the instructions which he may be giving to some other boy. If more solder is required, the project is presented again and the teacher is given the opportunity to see what progress has been made and can give additional instructions before giving out more solder. When an abundance of solder is left on the soldering table, the tendency is to waste the solder and spoil the job by putting much too much solder on.

After the process of riveting has been demonstrated to a group taking up that phase of metalwork, one or two rivets are given to each boy when his work is ready, and he proceeds with his riveting. He then brings his work to the instructor, who criticizes and offers suggestions and then gives the boy the remainder of the rivets needed, or gives a few more rivets to him and asks him to come back for further help when they have been used. This is the procedure when the teacher cannot actually watch the process of riveting. A pocket is therefore provided in the apron for rivets.

Any teacher who has taught printing as a part of general shop knows the nuisance of finding odd pieces of type here and there and everywhere in the shop, and generally at most inconvenient times. The small pocket labeled type is a truly convenient place to drop these *wanderers* until they can be returned to their proper places at leisure.

The average junior high school boy can break No. 55 and other small drills faster than the teacher can replace them, if they are left in the drill rack with the larger sizes. But if they must be obtained directly from the instructor with the instruction that they be returned to him when the hole is drilled, their life can be increased greatly. Therefore, the last group of four small pockets is used for keeping these and other pieces of equipment that are easily lost or broken.

Where the younger boys are required to acquire proficiency in cutting curves by hand before using the jig saw, there are many occasions when coping saws will be used for the smaller projects. Ordinarily the teacher will want to check the design or give additional cautioning concerning the use of the tool before the pupil is permitted to start sawing. The narrow pocket at the right of the roll book is ideal for a supply of these blades for the coping saw, as well as for extra blades for the jig saw.

The top pocket is divided into two parts, one being for a pencil and the other for a pad of shop passes which are given to deserving boys who wish to spend extra time on their work in the shop, at noon or evenings after school. This latter pocket is also used for holding printing proofs when graded away from the desk and also for keeping brush checks in.

The pocket for the roll book is located at such a height that it does not interfere with the free actions of the teacher in stooping and is used on those frequent periods when the work does not permit him to get to his desk except at intervals. The strap with the keys drops inside the apron and out of the way when not in use to open a supply or project locker. They are more convenient than when carried in the pocket or on a hook on the belt and are always available when needed.

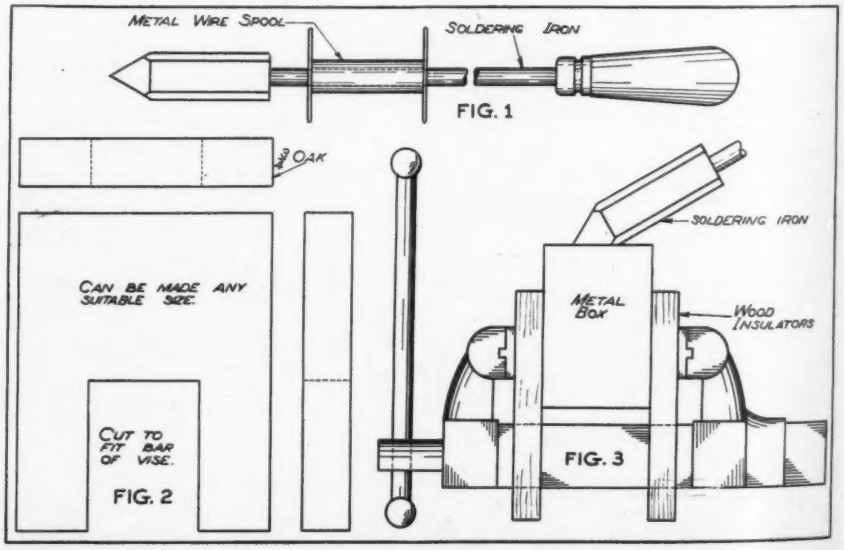
The changing of class sections to new types of work at the end of each cycle can be a fairly simple matter and the change made smoothly, or it can be a difficult and disorderly affair. An assignment board, Figure 3, is used for each section. At the beginning of each term each class is divided into sections 1–2–3–4. Special cards are prepared as are shown in Figure 6. Section 1 cards for each of the classes are assembled on one board with large staples. The same is done with each of the other sections. The board is so planned that only one section is seen at a time. At the right side of the board is a tin container having open hems on three sides, the top being left straight. Into this container the card is slid as illustrated, with the name of the activity, the bench or station number, and the special job for that particular station. At the beginning of the new cycle the activity cards are shifted on the assignment board and each boy has his activity, station, and special job.

It is characteristic of the American people to want their just place or turn. We all know the mutterings if not actual violence which takes place when someone tries to crowd in at the head of the line in front of a bank teller or theater window. It is frequently necessary to break up gangs of boys congregating around a jig saw or stain table, each waiting jealously to see that he gets his proper turn. A small blackboard as illustrated in Figure 4, placed in a convenient location, helps to relieve this congestion and also saves a good deal of the boy's time. As permission is granted a boy to use the jig saw, he puts his name on the board. This is then a record of where his particular turn is and he can go back to his bench and continue to work until those whose names appear above his on the blackboard are checked off and his turn comes.

The last step in the construction of the project is the finishing. Each teacher has his standards of quality of work expected before the finishing processes are started. In the shop where there is free access to brushes and finishing materials many projects will be stained or enameled long before they are ready. Here again desired supervision can be attained by controlling the equipment or supplies. The brush container shown in Figure 5 is made of oilcloth and is made of such a size that it will fit in the hip pocket. Two enamel and two stain brushes are kept in this container. When the student wants to paint or otherwise finish his project he fills out a brush check (see Fig. 6) and brings it with his work to the teacher. If the problem is ready for finishing, the teacher gives him the proper brush and retains the check. When the finishing operation is done, the brush is returned, properly cleaned, the boy is given back his brush check and the transaction is completed.

Color also serves its place as an aid in the shop. Each of the eight type stations in the printing unit of the shop is marked with a different color. The same color appears on each of eight sticks. The boy at case A which is marked in red uses the red stick, case B which is marked blue uses the stick with the blue markings, etc. These colors help settle arguments when one of the boys picks up a stick which someone else claims. It also helps locate the guilty boy who, at the end of a class period, does not return his stick to its proper place. The large storage galleys used by the printing classes have their edges painted in different colors, Class I knows that its galley is orange, Class 2 knows that its galley is green, etc. At the close of the period this is a great help in getting the work in the proper galley.

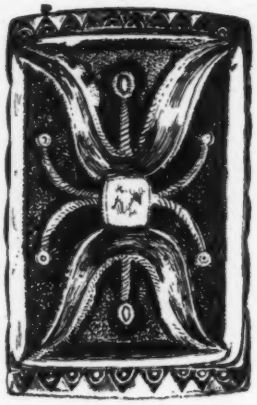
These teaching aids may not be the most important things in my shop, but they help to put important things first. They help to make the care of grades and brushes a matter of second importance and to put teaching in the first place, where it belongs.



Soldering Aids — Fig. 1, hot soldering iron holder. Fig. 2, wood insulators. Fig. 3, insulators in use. Submitted by Isadore M. Fenn, Chicago, Ill.

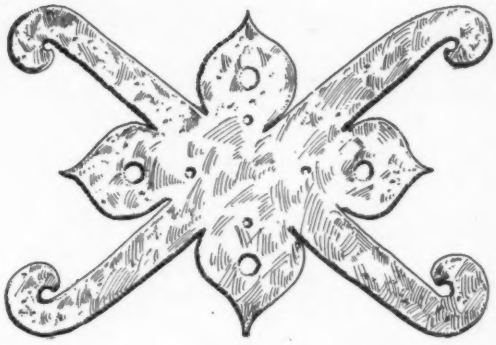
HOW HAS METAL BEEN USED IN FOLK ARTS?

These designs are typical of those based on traditional subjects and forms by groups living long in close identity.



Navajo Gato (bow-guard)
Cast in Silver

Pennsylvania-German Painted Tin
Coffee Pot, Eighteenth Century



Copper Ornament Made by the Moundbuilders
Sketched from Original in
Ohio State Historical
Museum

Brass Harness Ornament
Austrian Alps, Nineteenth Century

Sheet-Iron Inn Sign
Flemish, c.1800

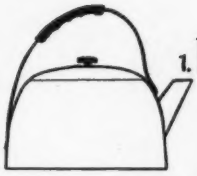
Bronze Hairpin, East Bohemia

(Last three items from "Peasant Art in Europe," Bossert

Plate 20. Design course by Burl N. Osburn, director of industrial arts, State Teachers College, Millersville, Pa.

HOW HAS THE MACHINE AFFECTED DESIGN IN METAL?

Since the industrial revolution, increasingly greater quantities and proportions of metal goods have been produced by the machine. This has altered fundamentally the basic design of metal articles.



1. It has made possible rapid, exact, and virtually unlimited duplication through the mechanization of basic processes. (e.g. drop forge)

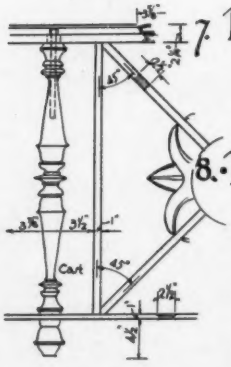
2. It has developed new methods having little or no basis in handicraft techniques. (e.g. extrusion, sandblasting)

3. Machine production has eliminated any reason for imitating the effects of hand tool methods on appearance.

4. Rapid copying of successful designs is made possible.

5. Articles must be designed for quick consumption in order to keep the machines going. The result is an increase in the methods of artificial obsolescence, such as the pressure on style changes in automobile design.

6. Speed of motion, made possible by machines, has brought need for reduction of fluid resistance. Streamlining has, quite illogically, tended to influence the design of articles not meant for motion.



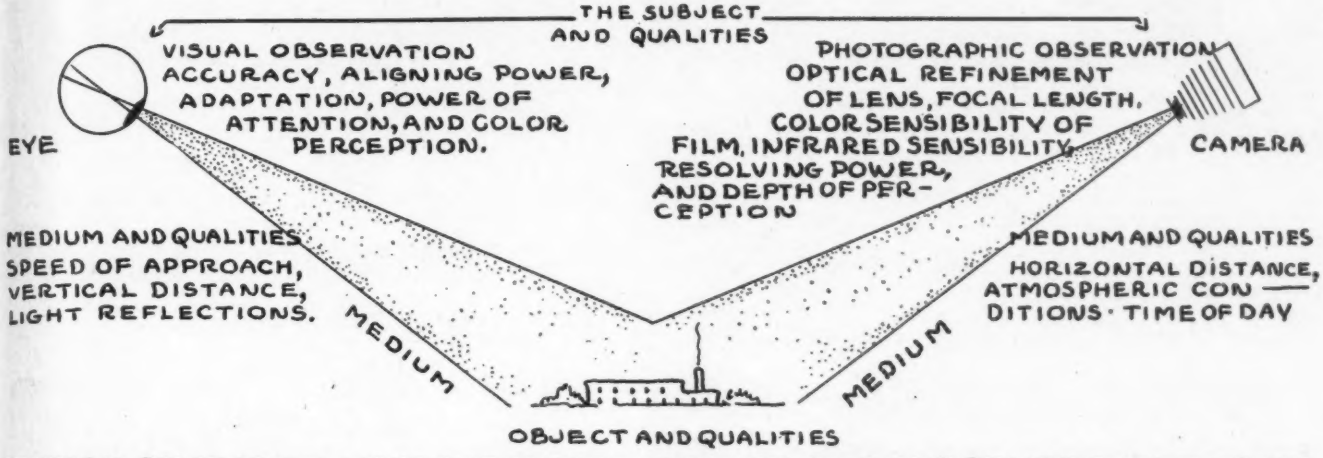
7. Distinctive personal, regional, or national characteristics tend to be eliminated.

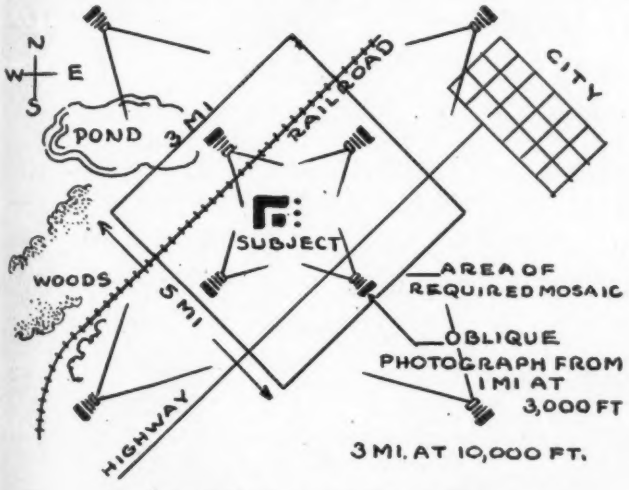
8. Detailed designing in advance of production becomes necessary, since fabrication probably will be done by numerous unskilled machine operators who, lacking the early craftsman's complete mastery, will be unable to work without external control.

Plate 21. Continuation of design course by Burl N. Osburn, director of industrial arts, State Teachers College, Millersville, Pa.

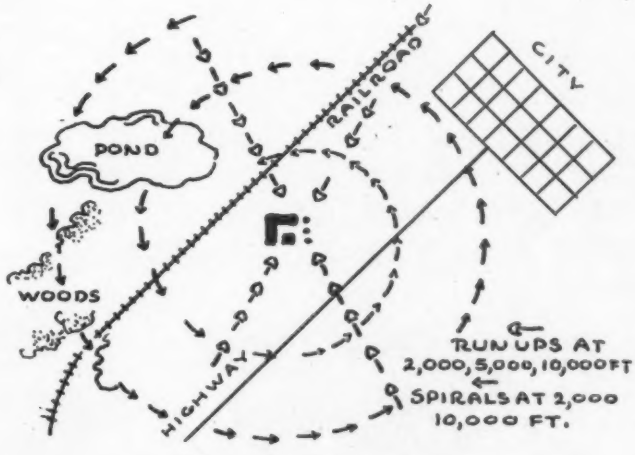
Camouflage Reconnaissance

THE CAMOUFLEUR SHOULD OBSERVE THE SITE FROM THE AIR AND SECURE MAPS, PLANS, ELEVATIONS, PHOTOGRAPHS, AND SIGNIFICANT DATA IN ORDER TO CARRY OUT THE SCHEME OF DECEPTION


THE SUBJECT AND QUALITIES
VISUAL OBSERVATION ACCURACY, ALIGNING POWER, ADAPTATION, POWER OF ATTENTION, AND COLOR PERCEPTION.
EYE
PHOTOGRAPHIC OBSERVATION OPTICAL REFINEMENT OF LENS, FOCAL LENGTH, COLOR SENSIBILITY OF FILM, INFRARED SENSIBILITY, RESOLVING POWER, AND DEPTH OF PERCEPTION
CAMERA
MEDIUM AND QUALITIES SPEED OF APPROACH, VERTICAL DISTANCE, LIGHT REFLECTIONS.
MEDIUM
MEDIUM
MEDIUM AND QUALITIES HORIZONTAL DISTANCE, ATMOSPHERIC CONDITIONS · TIME OF DAY
OBJECT AND QUALITIES
PATTERN, COLORATION, LIGHT AND SHADOW, TEXTURE, SIZE AND RELIEF, SURROUNDINGS



PHOTOGRAPHIC OBSERVATION



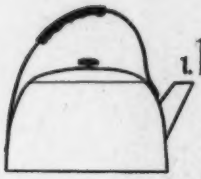
VISUAL OBSERVATION

HAVING DECIDED UPON A BASIC SCHEME, THE CAMOUFLEUR MAY DEVELOP HIS PLANS TO BE REVIEWED BY APPROPRIATE AUTHORITIES · SEVERAL WORKING-DRAWINGS MAY BE NEEDED AS FOR ANY ENGINEERING PROJECT · THE MAINTENANCE SHOULD BE CONSIDERED AS PART OF THE PLAN AND FREQUENT AND PERIODIC INSPECTION MAINTAINED FROM BOTH GROUND AND AIR. ···

Plate 7. Camouflage course by Richard E. Bailey, chairman, art department, Central High School, Providence, R. I.

HOW HAS THE MACHINE AFFECTED DESIGN IN METAL?

Since the industrial revolution, increasingly greater quantities and proportions of metal goods have been produced by the machine. This has altered fundamentally the basic design of metal articles.



1. It has made possible rapid, exact, and virtually unlimited duplication through the mechanization of basic processes. (e.g. drop forge)

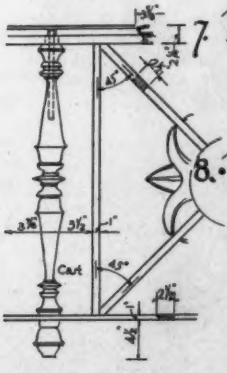
2. It has developed new methods having little or no basis in handicraft techniques. (e.g. extrusion, sandblasting)

3. Machine production has eliminated any reason for imitating the effects of hand tool methods on appearance.

4. Rapid copying of successful designs is made possible.

5. Articles must be designed for quick consumption in order to keep the machines going. The result is an increase in the methods of artificial obsolescence, such as the pressure on style changes in automobile design.

6. Speed of motion, made possible by machines, has brought need for reduction of fluid resistance. Streamlining has, quite illogically, tended to influence the design of articles not meant for motion.



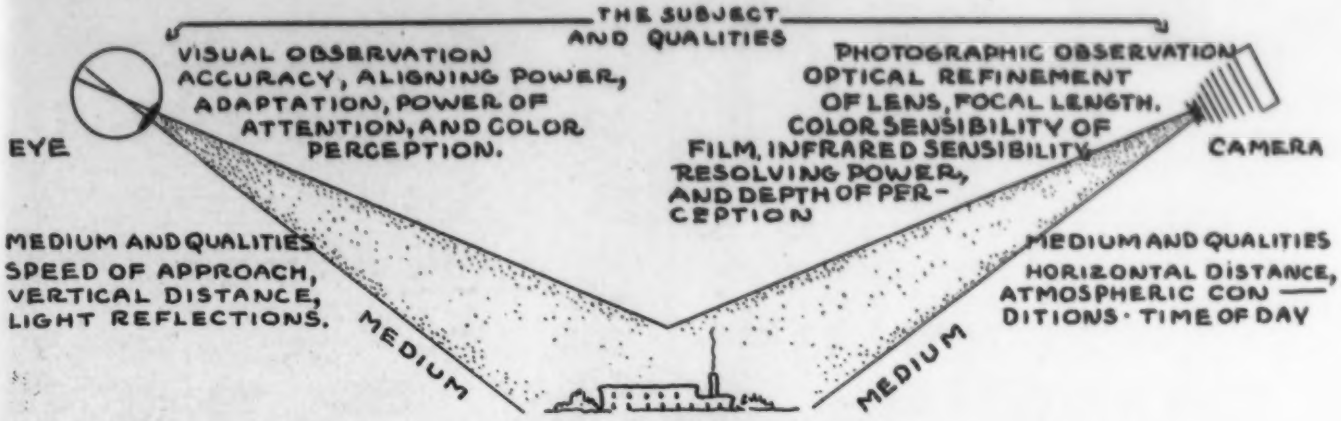
7. Distinctive personal, regional, or national characteristics tend to be eliminated.

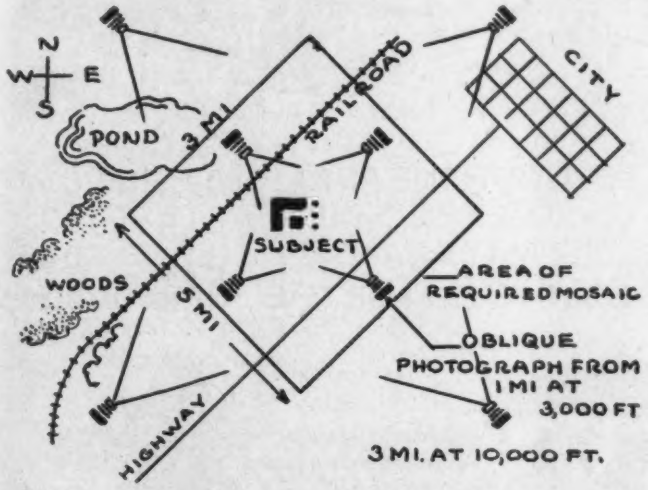
8. Detailed designing in advance of production becomes necessary, since fabrication probably will be done by numerous unskilled machine operators who, lacking the early craftsman's complete mastery, will be unable to work without external control.

Plate 21. Continuation of design course by Burl N. Osburn, director of industrial arts, State Teachers College, Millersville, Pa.

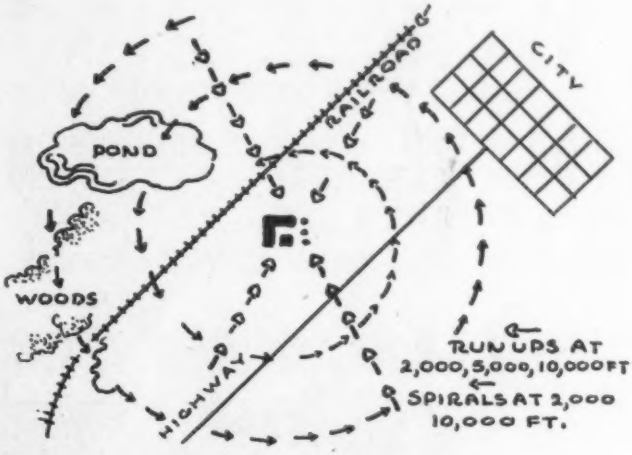
Camouflage Reconnaissance

THE CAMOUFLEUR SHOULD OBSERVE THE SITE FROM THE AIR AND SECURE MAPS, PLANS, ELEVATIONS, PHOTOGRAPHS, AND SIGNIFICANT DATA IN ORDER TO CARRY OUT THE SCHEME OF DECEPTION


THE SUBJECT AND QUALITIES
VISUAL OBSERVATION ACCURACY, ALIGNING POWER, ADAPTATION, POWER OF ATTENTION, AND COLOR PERCEPTION.
EYE
PHOTOGRAPHIC OBSERVATION OPTICAL REFINEMENT OF LENS, FOCAL LENGTH. COLOR SENSIBILITY OF FILM, INFRARED SENSIBILITY RESOLVING POWER, AND DEPTH OF PERCEPTION
CAMERA
MEDIUM AND QUALITIES SPEED OF APPROACH, VERTICAL DISTANCE, LIGHT REFLECTIONS.
MEDIUM
MEDIUM
MEDIUM AND QUALITIES HORIZONTAL DISTANCE, ATMOSPHERIC CONDITIONS · TIME OF DAY
OBJECT AND QUALITIES
PATTERN, COLORATION, LIGHT AND SHADOW, TEXTURE, SIZE AND RELIEF, SURROUNDINGS



PHOTOGRAPHIC OBSERVATION

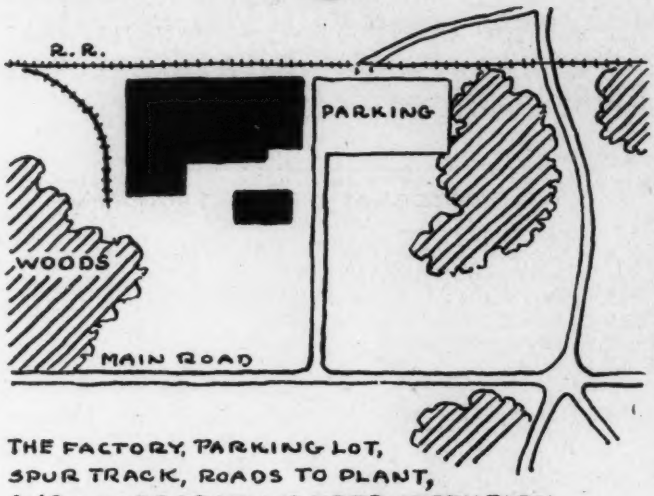


VISUAL OBSERVATION

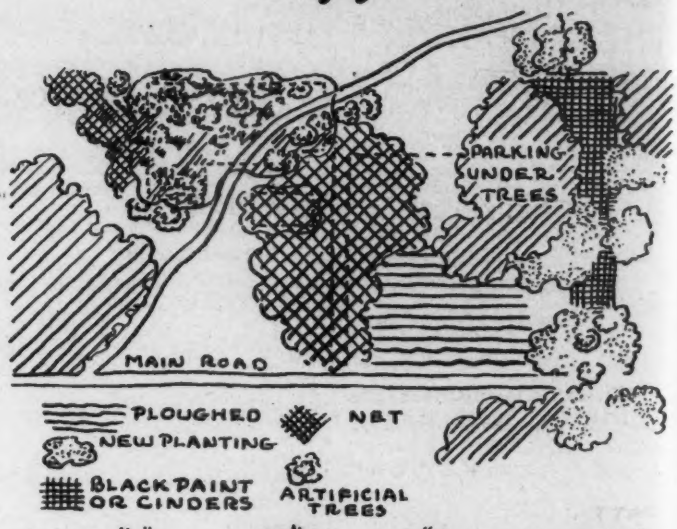
HAVING DECIDED UPON A BASIC SCHEME, THE CAMOUFLEUR MAY DEVELOP HIS PLANS TO BE REVIEWED BY APPROPRIATE AUTHORITIES · SEVERAL WORKING-DRAWINGS MAY BE NEEDED AS FOR ANY ENGINEERING PROJECT · THE MAINTENANCE SHOULD BE CONSIDERED AS PART OF THE PLAN AND FREQUENT AND PERIODIC INSPECTION MAINTAINED FROM BOTH GROUND AND AIR. . .

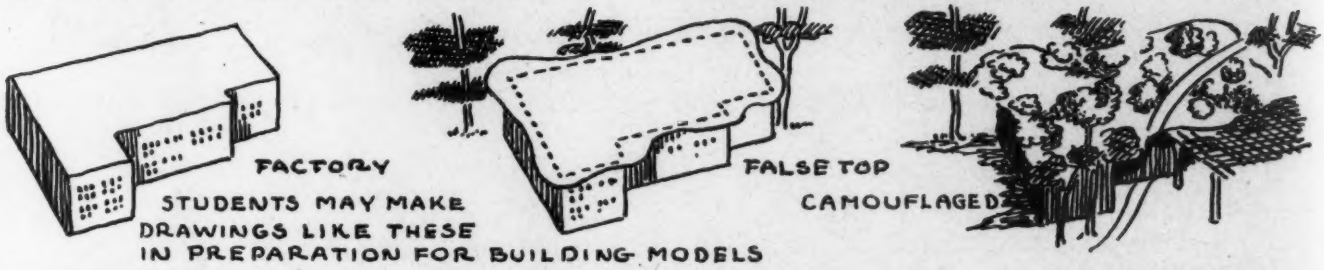
Plate 7. Camouflage course by Richard E. Bailey, chairman, art department, Central High School, Providence, R. I.

Camouflage Application



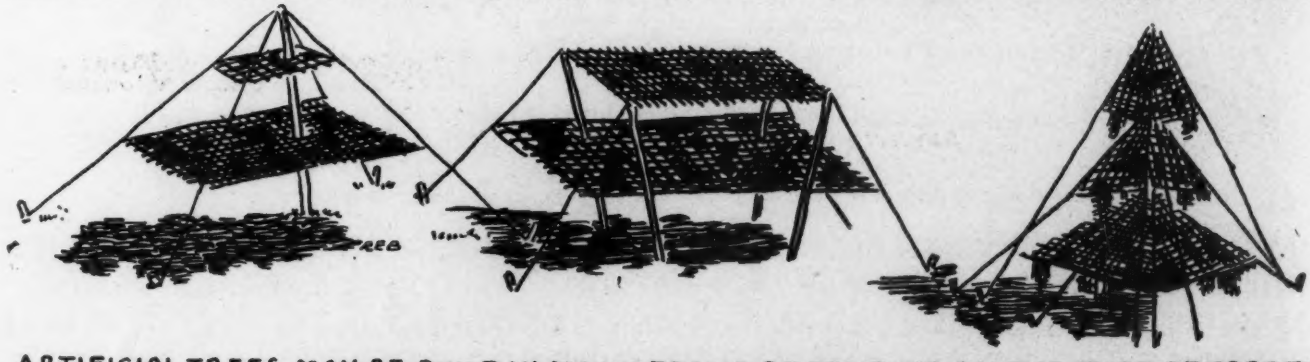
THE FACTORY, PARKING LOT, SPUR TRACK, ROADS TO PLANT, AND INTERSECTION NEED ATTENTION





STUDENTS MAY MAKE DRAWINGS LIKE THESE IN PREPARATION FOR BUILDING MODELS

THE ARTIFICIAL TREE SHOULD HAVE A CLEAR OUTLINE AND A CLEAR SHADOW. THE NETS ARE ARRANGED AT DIFFERENT LEVELS, GARNISHED WITH TEXTURE MATERIALS AND SO FILLED THAT ONE LEVEL CASTS SHADOW ON THE NEXT ONE BELOW. THEY ARE BUILT NOT ONLY TO HIDE BUT TO CHANGE THE SURROUNDINGS.



ARTIFICIAL TREES MAY BE BUILT IN MANY FORMS, DEPENDING ON THE TYPE OF TREE THE CAMOUFLEUR NEEDS TO CONFORM TO THOSE SURROUNDING THE CAMOUFLAGE JOB-

Plate 8. Continuation of camouflage course by Richard E. Bailey, chairman, art department, Central High School, Providence, R. I.

Thoughtful selection NOW means satisfactory texts in September!

WOODWORKING

OPERATION OF COMMON WOODWORKING MACHINES, Hjorth $1.72
MACHINE WOODWORKING, Hjorth 3.25
PRINCIPLES OF WOODWORKING, Hjorth 1.76

MECHANICAL DRAWING

MECHANICAL DRAWING, Berg
Book I ..... .64
Book II ..... .56
Complete Edition, cloth 1.80
Complete Edition, paper 1.40

MECHANICAL DRAWING, Ermeling, Fischer, and Greene
First Year ..... .45
Key Plates 1.50
Second Year ..... .60

BLUEPRINT READING FOR THE METAL TRADES, DeVette and Kellogg 1.76
Teacher's Key ..... .25*

A PRIMER OF BLUEPRINT READING, Diamond ..... .60
Answer Book ..... .10*

AUTOMOTIVE

AUTOMOTIVE SERVICE, Kuns
Volume I 3.50
Volume II 3.75
Combination price, both volumes 6.75

ELECTRICITY

FUNDAMENTALS OF APPLIED ELECTRICITY, Jones $2.60

ESSENTIALS OF APPLIED ELECTRICITY, Jones. 1.36

PRACTICAL ELECTRICITY, Crawford 1.96

FUNDAMENTALS OF ELECTRICITY, Petersen.. .96

MATHEMATICS

AVIATION MATHEMATICS, Felker, Paine, and Schweinhagen ..... Ready soon

HELICAL MILLING, Felker 1.00

MILLING-MACHINE INDEXING, Felker and Paine 1.50

SHOP MATHEMATICS, Felker 2.20
Answer Book ..... .30*

APPLIED MATHEMATICS, Johnson 1.60
Answer Book ..... No charge

METALWORK

OXYACETYLENE WELDING, Matteson ..... .72

ELECTRIC WELDING, Matteson ..... .40

AIRCRAFT RIVETING FUNDAMENTALS, Tabraham ..... .32

*No charge on adoption of text

Get your copies of these popular texts for thirty days' study from

THE BRUCE PUBLISHING COMPANY
706 MONTGOMERY BUILDING MILWAUKEE, WISCONSIN

Association News

♦ The Connecticut Industrial Arts Association held its annual spring convention on Saturday, April 10, 1943, at the Teachers College of Connecticut at New Britain.

The main speaker, Dr. Gordon O. Wilbur, director of the division of industrial-arts teacher education at Oswego State Teachers College, Oswego, N. Y., and author of many books and magazine articles, spoke on "Industrial Arts Teacher and Training for the Air Age."

The convention this year was confined to one day instead of the usual two because of the rationing restrictions in force.

—*A. M. Andersen*

♦ John A. Backus, of the educational department of the American Type Founders, speaking recently before a large group of printing teachers, called attention to three urgent needs in the program of Graphic Arts Education. He said in part:

"We know that in this educational program for an industrial civilization, more and more emphasis must be placed on definiteness of purpose by the close co-ordination between American industry and education. I believe that the success of graphic arts education, especially on the vocational level, in the years just ahead, will depend on this modernizing factor.

"Let each one start immediately to prepare an educational analysis—a job analysis of the program. Let us search out ways and means for improvement leading to greater efficiency. Let us check our tools and equipment and make note of those antiquated and wornout items that spell inefficiency. Then let us prepare a report outlining ways and means, whereby the educational efficiency of the program can and should be improved.

"Printing and education are inseparable. This is a self-evident truth and educators know that industry looks to both for an intelligent and understanding consumer and producer of its products. With taxes riding high and subject competition increasing, it is now time to take our educational products out of storage and let the citizen in on the secret."

♦ At a recent meeting of the Mu Sigma Pi Graduate Fraternity of Wayne University, Detroit, Mich., the following officers were elected: president, Delmar Pardonnet; vice-president, Robert Shields; recording secretary, Fred Schelter; corresponding secretary, G. Manson Taylor; treasurer, Francis L. Zwickey; and executive board, Herbert Kolkind.

Standing, left to right: Fred Schelter, Francis Zwickey, and Herbert Kolkind — Seated, left to right: Delmar Pardonnet and Manson Taylor

♦ The Industrial Arts and Vocational Education Society of St. Louis held its annual election of officers on April 7. The following are the officers for the present year: president, Harold M. Gray, Sumner High School; vice-president, Frank D. Young, Charles Turner School; secretary, Robert E. James, Vashon High School; assistant secretary, A. B. Green, New Lincoln School; and treasurer, John Davis, Vashon High School.

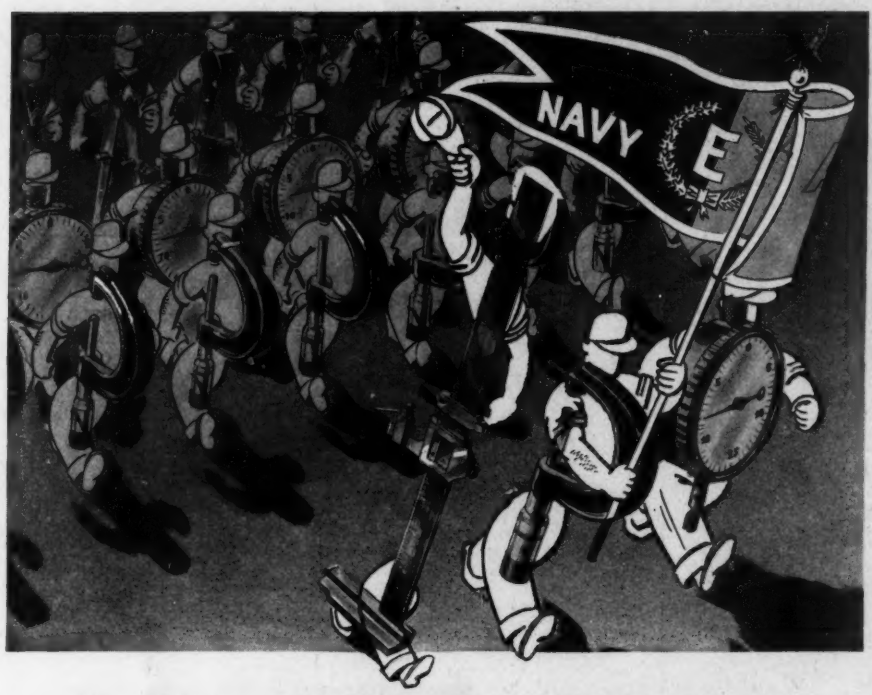
The purposes of this organization are: to promote professional interest in industrial arts; to promote vocational training of youth; to make the members aware of all civic and economic movements relative to employment in the metropolitan area of St. Louis; to keep the members informed concerning national and state issues relative to general vocational and industrial education; to promote good and wholesome fellowship among its members; and to take an active interest in school affairs.—*Harold M. Gray.*

♦ The War Training Conference of the Illinois Vocational Association was held at Pere Marquette Hotel, Peoria, Ill., on April 2, and 3, 1943.

The first general session was held in connection with the annual I.V.A. dinner Friday evening at 6:30 p.m.

Rose A. Clark, president, Illinois Vocational Association, Chicago, was the chairman, and Vernon L. Nickell, state superintendent of public instruction, Springfield, Ill., acted as toastmaster. The main address was given by Brigadier General Stephen G. Henry, commandant, Armored Force School, Fort Knox, Ky. He complimented the teachers of industrial arts and vocational education because they had made it possible for thousands to fit into the technical positions which the army has to fill if we are to be victorious in the present war.

(Continued on page 20A)



NOW, THE MAKERS OF STARRETT TOOLS

GET THEIR "E" BADGES

It is fitting that the craftsmen and women who have contributed their utmost skill and energy to the fashioning of unprecedented numbers of precision tools — who kept faithfully and constantly at their vital task from the moment the first bomb was dropped on Poland — now wear this badge of honor, evidencing "outstanding achievement in producing war equipment."

Grateful acknowledgment is also due our suppliers and the distributors of Starrett Tools for having done so much to help us attain this honor.

STARRETT TOOLS are lending accuracy and speed and confidence to hundreds of thousands of willing and devoted hands helping to win this war of precision machines and equipment. It is safe to say that virtually every winner of the "E" award has depended directly or indirectly upon the use of Starrett Tools.

The wearing of the "E" badge constantly reminds each and every one of us to keep on doing our level best to produce an adequate supply of the tools worthy of this great responsibility.

THE L. S. STARRETT CO., ATHOL, MASSACHUSETTS, U. S. A.

World's Greatest Toolmakers

STARRETT TOOLS

Precision Tools... Dial Indicators... Ground Flat Stock... Hacksaws... Metal Cutting Band Saws... Steel Tapes

When *Black* Means *White!*

OUT OF CARBON . . . blackest substance man knows . . . comes the whitest, brightest light that man has achieved . . . that of the carbon arc lamp. With an intensity of light rivaling that of the sun, the useful carbon arc is necessary in giant searchlights for anti-aircraft defense, battleships, and other vital uses . . . in motion picture projectors . . . in sun lamps that heal and lamps that increase the vitamin D content of milk . . . in accelerated testing equipment that points the way to longer life for fabrics, paints, plastics, and other materials you use.

Without carbon and its wonders, our electrical civilization could not have been born. For without brushes made from carbon, electricity for light and power could not be generated in vast amounts . . . today's automobiles would not run . . . today's airplanes would not leave the ground.

Without carbon, in the form of electrodes and anodes, much of the highest quality steel, many of the chemicals, and other useful substances vital to this nation could not be made. For years, NATIONAL CARBON COMPANY, INC., a Unit of UCC, has studied carbon and graphite . . . their properties and uses . . . and has made useful things from them. Much has been accomplished. Through further research in carbon, more answers for tomorrow's problems are being found.

Research and engineering developments in carbon made by National Carbon Company, Inc., have been tremendously facilitated by the electric-furnace experience and the knowledge of industrial gases and chemicaus of other Units of Union Carbide and Carbon Corporation.

BUY UNITED STATES WAR BONDS AND STAMPS

ACTION! CAMERA! Without the high-intensity carbon arc . . . used for photographing motion pictures and projecting them in theaters . . . we would not have the high-quality motion pictures of today.

CARBON, THE VERSATILE. In addition to its electrical uses, electric furnace graphite, a form of carbon, is used for making absorption towers, heat exchangers, and pumps for corrosive liquids; and for making metallurgical molds.

MAN-MADE INFERNO. Modern alloy steels are made in electric furnaces. These furnaces depend upon huge carbon and graphite electrodes for intense heat. They help make more . . . and better . . . steels.

LIFE SAVER. Activated carbon is necessary for gas masks to give protection against industrial and war gases. It also aids in the recovery of millions of pounds of solvents used by industry each year.

UNION CARBIDE AND CARBON CORPORATION

30 East 42nd Street UCC New York, N. Y.

Principal Products and Units in the United States

ALLOYS AND METALS
Electro Metallurgical Company
Haynes Stellite Company
United States Vanadium Corporation

CHEMICALS
Carbide and Carbon Chemicals Corporation

ELECTRODES, CARBONS AND BATTERIES
National Carbon Company, Inc.

INDUSTRIAL GASES AND CARBIDE
The Linde Air Products Company
The Oxweld Railroad Service Company
The Prest-O-Lite Company, Inc.

PLASTICS
Bakelite Corporation
Plastics Division of Carbide and Carbon Chemicals Corporation

(Continued from page 18A)

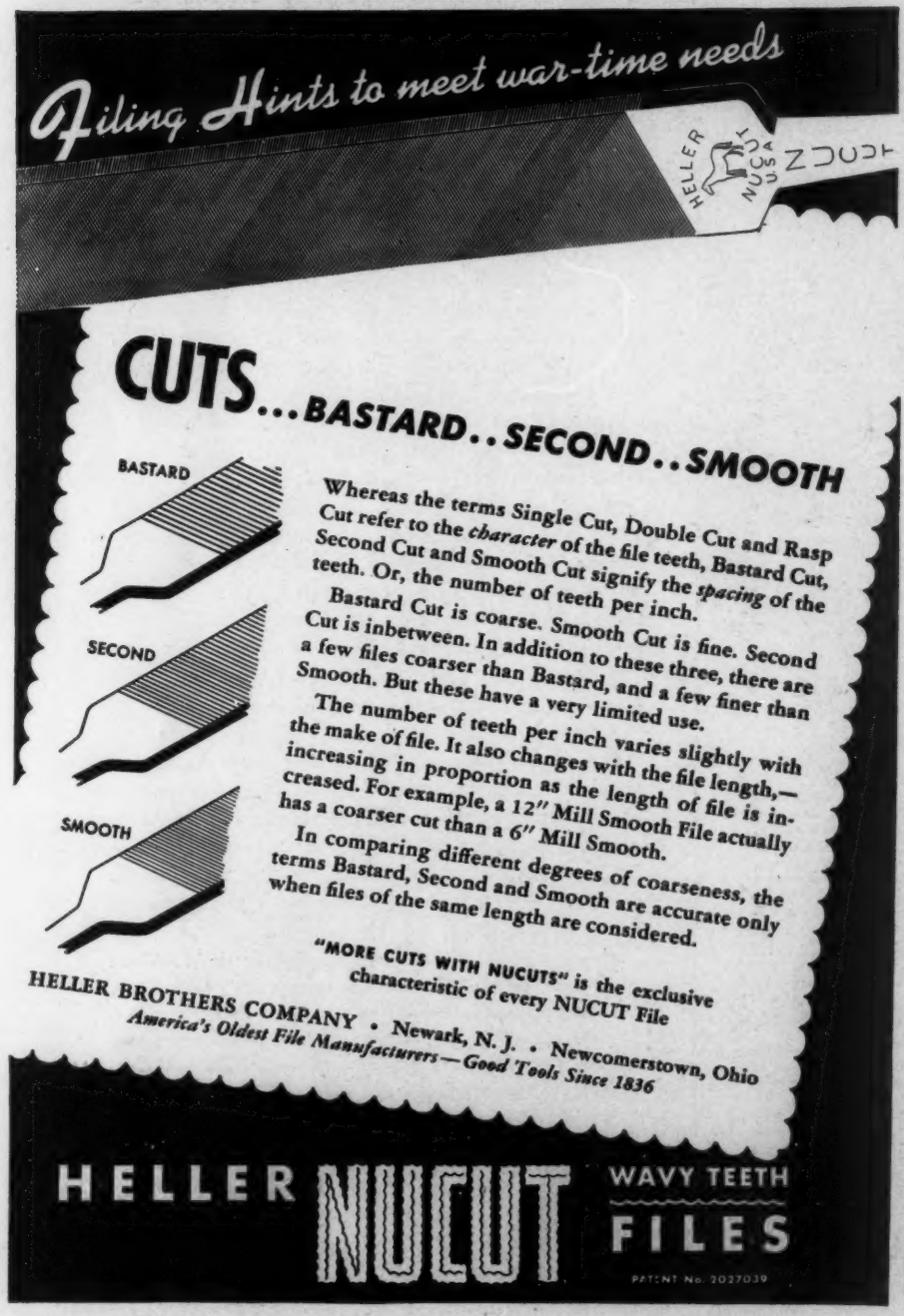
He explained very clearly what was done to introduce and fit the American boy into the complex organization of our armed forces.

At the general meeting on Saturday morning, L. J. Fletcher, director of training, Caterpillar Tractor Co., Peoria, Ill., explained the method of "Training in the War Industries." He was followed by Vernon L. Nickell, who spoke on "The Illinois War Training Program." Fred A. Smith, president, American Vocational Association, Little Rock, Ark., and L. H. Dennis, executive secretary, American Vocational Association, Washington, D. C., then spoke on "National Legislation Relating to Vocational Education."

Albert F. Siepert, dean, Bradley Polytechnic Institute, Peoria, Ill., was the chairman at the I.V.A. luncheon held on Saturday. This luncheon was then followed by the Ship's program at which C. A. Roper, McKnight & McKnight, Bloomington, Ill., was captain, and R. H. Simpson, The Manual Arts Press, Peoria, Ill., was the deck officer.

Many sectional meetings were held on Friday morning and afternoon. At these meetings agricultural, art, business and distributive, homemaking, industrial arts, industrial part time and full time, personnel and guidance subjects were discussed.

Lt. Col. Verne C. Fryklund, Civilian Preinduction Training Branch, Services of Supply, War Department, Washington, D. C., was the speaker at the industrial-arts meeting. He gave an excellent picture of the need of preinduction training and of what this training must consist if it is to be effective.


Filing Hints to meet war-time needs
HELLER NUCUT
CUTS...BASTARD..SECOND..SMOOTH
BASTARD
SECOND
SMOOTH
Whereas the terms Single Cut, Double Cut and Rasp Cut refer to the character of the file teeth, Bastard Cut, Second Cut and Smooth Cut signify the spacing of the teeth. Or, the number of teeth per inch.
Bastard Cut is coarse. Smooth Cut is fine. Second Cut is inbetween. In addition to these three, there are a few files coarser than Bastard, and a few finer than Smooth. But these have a very limited use.
The number of teeth per inch varies slightly with the make of file. It also changes with the file length,—increasing in proportion as the length of file is increased. For example, a 12" Mill Smooth File actually has a coarser cut than a 6" Mill Smooth.
In comparing different degrees of coarseness, the terms Bastard, Second and Smooth are accurate only when files of the same length are considered.
"MORE CUTS WITH NUCUTS" is the exclusive characteristic of every NUCUT File
HELLER BROTHERS COMPANY • Newark, N. J. • Newcomerstown, Ohio
America's Oldest File Manufacturers—Good Tools Since 1836
HELLER NUCUT WAVY TEETH FILES
PATENT No. 2027039

C. I. Carlson, Aurora, Ill., was elected as the chairman of the industrial-arts section for next year.

At the annual meeting held Friday afternoon, Warren E. Hill, director of the Chicago Vocational School, was elected president, and Chris Peterson, shop superintendent of the Lane Technical High School, Chicago, Ill., was elected the treasurer.

♦ The Wisconsin Association for Vocational and Adult Education, held at the Schroeder Hotel, Milwaukee, Wis., April 30 and May 1, 1943, opened with the general meeting at 9:30 a.m. on Friday.

The president of the association, John F. Jones, presided. Herman F. Geske, state chaplain, Army and Navy Union, and member of Milwaukee Vocational School Faculty, unveiled a service plaque in honor of all members of the WAVAE and their students who are now serving in the armed forces of their country. This plaque was made by Emil F. Kronquist of the Milwaukee Vocational School.

A. H. Lauterbach, general manager, Pure Milk Association, Chicago, Ill., spoke on the subject "Food Will Win the War, and Write the Peace." He emphasized the fact that America will be obliged to feed its own people as well as those nations that will be liberated from the oppression of the ruthless axis nations. For this reason the problems of the farmer must be carefully studied, and such help as can be given to him, must be given promptly.

In his address, "How to Beat the Japs," Dr. No Yong Park, Chicago, Ill., pointed out the dire necessity of taking care of the Japanese situation, and expressed the conviction that long after Hitler and his confreres are dead and buried, the Japs will be still fighting.

Fred M. Mason, Madison, was chairman of the meeting that followed the Local Board Members luncheon. Mayor James R. Law, Madison, spoke on "What the Vocational School Means to the Local Community." He pointed out that vocational education may be very necessary now, but that it also must be emphasized for the peacetime which is to follow this world upheaval.

This organization passed a resolution recommending to Gov. Goodland favorable consideration of senate bill 406A which provides for more financial state aid for vocational education.

Sectional meetings were held by teachers and others interested in agriculture, attendance, commercial work, co-ordination, distributive occupations, general subjects, homemaking, rehabilitation, secretarial and office work, trades and industry, automotive service, drafting, electricity, machine shop and welding, printing, sheet metal, and woodworking.

At the business meeting John F. Jones and Clare D. Rejahl were re-elected respectively as president and secretary of the association for the coming year.

The usual Skiff program was staged Saturday morning with John Claude of The Bruce Publishing Company, Milwaukee, acting as prize distributor.

Personal News

♦ Laurence J. Young, formerly supervisor of shopwork in the elementary and junior high schools of Brooklyn, N. Y., has retired after 37 years of service.

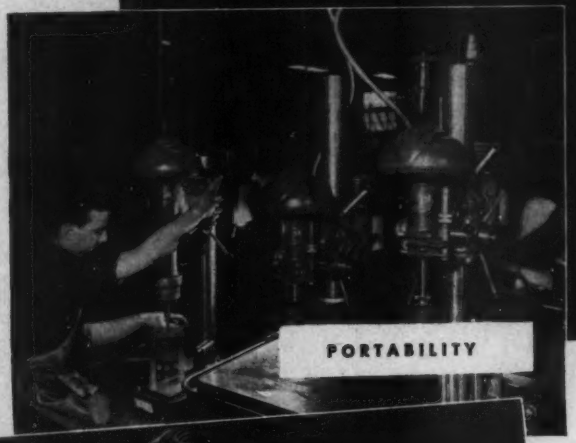
He began as a teacher of shopwork in Brooklyn, in 1907. After serving for ten years, he was made assistant director of shopwork, and in 1932 he was placed in sole charge of the work.

He will now act as supervisor of the training division of the Sperry Gyroscope Company, at their Lake Success Plant, near Great Neck, L.I., N. Y.

(Continued on page 23A)

Lessons Learned by Industry

WILL INFLUENCE THE SCHOOL SHOPS OF TOMORROW



An extra spindle in a hurry when it is needed . . . a special machine made quickly and economically from standard parts . . . a compact machine handling a job more efficiently than a heavier, costlier machine . . . these and many other advantages of light machine tools have been learned by thousands of production men in the sweat and strain of meeting war quotas.

School shop men have long known the advantages of Delta Machines. In many hundreds of school shops, from coast to coast, they have incorporated them in their instruction programs. After the war — these low-cost machines will inevitably play a more important part in industrial education.

ARE YOU GETTING "Tooling Tips?"

Delta issues an interesting bulletin that enables industrial educators to keep informed about the latest machine developments in the industrial field. If you wish to receive "Tooling Tips" regularly just fill out and mail the coupon. There is no subscription charge, no obligations of any sort.

DELTA
MILWAUKEE

The Delta Manufacturing Company
660-F E. Vienna Ave., Milwaukee, Wis.

Please place my name on the mailing list to receive "Tooling Tips" as issued.

Name ..... Position .....
School .....
Address ..... State .....
City .....
☐ Also send me copy of latest Delta Catalog.

"MODEL-DIP"

A FLAT BLACK FINISH FOR MODEL AIRCRAFT

Quick-Drying — Economical. Simply immerse models for a moment in Model Dip and allow to drain. A rapid, simple, effective method of finishing. May be applied with a brush if desired. Available only in quarts @ $1.25 or gallons @ $4.25 f.o.b. Milwaukee.

SEALACELL FINISHES

FOR SCHOOL PROJECTS—FURNITURE—CABINETS—WOODWORK.
Resistant to Alcohol, Cosmetics and Hot Dishes.

NO BRUSHES REQUIRED — APPROXIMATE COST 1¢ PER SQUARE FOOT — **NO RUBBING BETWEEN COATS**

Apply With a Cloth — Dustproof on Application. No Special Finishing Room Required. All Sanding Done On Raw Wood. **SEALACELL** Never Raises the Grain of the Wood. Can Be Mixed With Ground in Oil Colors for Staining.

SEND FOR **SEALACELL** DEMONSTRATION KIT — Enough Material to Finish Approximately 100 Square Feet of Surface. Price of Complete Kit, $1.00.

Send For Folder "Facts." A Post Card Will Bring It.

GENERAL FINISHES SALES AND SERVICE CO.

Pioneers in Development and Service

1548 WEST BRUCE STREET MILWAUKEE, WISCONSIN

The Pennsylvania State College

Summer Sessions - 1943

Inter-Session
June 7 to June 25

Main Summer Session
June 28 to August 6

Post-Session
August 9 to August 27

The Summer Semester
June 7 to September 24

Trade and Industrial and Industrial Arts Education

Doctors', Masters', and Baccalaureate degrees

Three summer sessions for in-service teachers, administrators, and other qualified individuals. Short, unit courses designed to meet current national problems.

for further information and catalogue address:

Director of Summer Sessions
Room 104 Burrowes Building

THE PENNSYLVANIA STATE COLLEGE
State College Pennsylvania

WAR TRAINING BOOKS

PRINCIPLES OF ELECTRICITY
by Cornetet and Fox

A new text designed specifically for pre-induction training. Follows course outline prepared jointly by War Dept. and U. S. Office of Education, to provide Senior High School boys with required basic knowledge of electricity. 258 illustrations, 256 pages. Price $1.60.

READING AIRCRAFT BLUEPRINTS — *Goff and Novak*

An entirely different text. Presents up-to-date blueprints of modern planes. Clear, easily understood. Every blueprint has been prepared to scale. Price $2.00.

BLUEPRINT READING, CHECKING AND TESTING — *Steinike*

A unique blueprint reading procedure with actual blueprint reproductions. Two parts. Price $2.00.

METALWORK, TECHNOLOGY AND PRACTICE *by Oswald A. Ludwig*

Presents elementary information in the metalworking fields and allied trades. Includes all machine shop trades, automotive and aeronautical work, metal pattern making, etc. 400 pages, 662 illustrations.

Write for approval copies.

MCKNIGHT & MCKNIGHT
BLOOMINGTON ILLINOIS

MODEL AIRPLANE BOOKS

Tom's Book of Flying Models
Instruction Manual .....15¢ Postpaid

Flying Models — How to Build and Fly Them
Instruction Manual .....35¢ Postpaid

PAUL K. GUILLOW -:- Wakefield, Mass.

DRAWING MATERIALS

WEBER
Trade Mark Reg. U.S. Pat. Off.

- WATERPROOF DRAWING INKS
- STUDIO, SCHOOL AND DRAFTING ROOM FURNITURE

ARTISTS' COLORS AND MATERIALS

Catalog Vol. 700 to Teachers and Schools on request.

PATRONIZE YOUR NEAREST WEBER DEALER

F. WEBER CO.
Manufacturing Artists' Colormen Since 1853
PHILADELPHIA, PA.
St. Louis, Mo. Baltimore, Md.

Four-Sided Saw-Frame is distortion-proof and surrounds the blade and the work. Backing-Plate Blade-Support gives rigidity to blade assembly. Saw-Frame Guide is fitted with eight bearings, with hardened and ground inserts, making for vibrationless, accurate operation. This combination of features is found only in Peerless Metal Cutting Saws.

Blade Control...*the first essential for* PRECISION CUTTING *at high speed*

Students are taught basic facts first — and in precision sawing at high speed, the first essential is absolute control of the blade to assure cutting to close tolerance.

In Peerless Metal Cutting Saws, the blade is locked rigidly in place. There is no bowing or tilting, even under maximum tensioning. The reasons are that the Peerless Four-Sided Saw-Frame is distortion-proof; the Backing-Plate Blade-Support permits extreme tensioning with no distortion. And the Saw-Frame Guide, fitted with renewable and precision-ground ways, assures cutting to the closest possible tolerance with no vibration or variation.

Explain the importance of *blade control* in high speed precision metal sawing. The Peerless booklets will prove interesting and helpful to you and to your classes.

PEERLESS MACHINE COMPANY
1600 JUNCTION AVE. RACINE, WISCONSIN

PEERLESS MACHINE COMPANY, Dept. IAV-643, Racine, Wis.
Mail cutting time estimate for .....
.....
☐ Mail catalog on Hydraulic type Saw for High Production Cutting
☐ Mail catalog covering Vertical type used for Die Block Work
☐ Mail catalog on Mechanical type Saw for production cutting
☐ Mail catalog on general utility and maintenance Saws
Company .....
Individual .....
Street .....
City ..... State .....

Peerless
THE ONLY METAL CUTTING SAW
WITH FOUR-SIDED SAW-FRAME AND BACKING-PLATE

Fast ACCURATE Sawing DEMANDS PEERLESS BLADE CONTROL

(Continued from page 20A)

A banquet was given in his honor by the city's shop guilds at a party held at the Hotel Pennsylvania on Thursday evening, May 6. Charles Passiglia, president of the Manhattan guild, was chairman of the arrangements committee.

♦ LT. COL. VERNE C. FRYKLUND, until recently Head of the Teacher Training Department, Armored Force School, Fort Knox, Ky., has been transferred to Washington, D. C., to represent the army in the Preinduction Training Program. Lt. Col. Fryklund was formerly associate professor of industrial education, University of Minnesota, Minneapolis, Minn.

Lt. Col. Verne C. Fryklund

♦ DR. SHRIVER L. COOVER, director of industrial arts at State Teachers College, California, Pa., has recently been elected president of the industrial-arts division of the Pennsylvania State Education Association. He will have charge of the speakers and program for the summer meetings of the industrial-arts section of the Pennsylvania Vocational Association.

♦ DR. WILLIAM J. MICHEELS has been made Chief Training Specialist with the Office of Defense Transportation, Washington, D. C. Previous to accepting this position, Dr. Micheels was assistant director of the Teacher Training Department, Armored Force School, Fort Knox, Ky., since its beginning in February of 1942.

Dr. Micheels received the Ph.D. degree under Dr. Homer J. Smith at the University of Minnesota, Minneapolis, Minn., and holds a degree from The Stout Institute, Menomonie, Wis.

♦ M. RAY KARNES, for the past year a member of the Teacher Training staff at the Armored Force School, Fort Knox, Ky., is now assistant director of the Teacher Training Department, replacing Dr. William J. Micheels.

Mr. Karnes was formerly assistant professor of industrial education at North Texas State Teachers College, and later was state supervisor of Defense Training in Missouri. He completed the course requirements for the Ph.D. degree under the late Professor R. W. Selvidge at the University of Missouri.

♦ DR. C. P. SCOTT, professor of vocational teacher education at the University of Pittsburgh, is on leave of absence for the duration of the war. Dr. Scott has taken a position as assistant director of industrial relations for the Dravo Corporation.

♦ MR. ROBERT M. KECK, industrial-arts instructor at State Teachers College, California, Pa., has received a commission as captain in the signal corps of the U. S. Army. He is now stationed at Fort Monmouth, N. J.

♦ MR. B. J. PHILLIPS, for 26 years connected with the vocational and adult education work in West Allis, Wis., was honored with a testimonial dinner, which was attended by the entire staff of the school. The school staff presented a wrist watch to Mr. Phillips.

♦ FRANK A. LAING, a teacher of industrial arts in the Milwaukee Public Schools since April 22, 1918, passed away on Monday, April 19.

Mr. Laing had been on leave of absence since September, 1942, because of ill-health. Until the time of his death, Mr. Laing planned to return to his teaching position in September, 1943.

Answers to Questions

GLAZE FOR ANTIQUING

1099. Q.: Could you give us a formula for mixing up a "wiping stain" for antiquing over white or ivory enamels?

Also please state whether this would also be usable over lacquers. — *H. L. F.*

A.: There is a matter of correct definitions to clear up before answering this question. *Wiping stain* as such is a material used to blend out sap and other off-color portions on a stained surface and is applied as a wipe coat *under* the top clear coats which follow.

Contrasted with this is the *glaze coat* used as an antiquing or aging color blend along molding or lines of carving. This is a thin liquid containing some pigmented color which is applied

(Continued on page 24A)

Training For War Production
Requires GOOD TOOLS
Write for Catalog No. 34 showing STANLEY TOOLS for all School Shops . .
STANLEY TOOLS
FOR SHEET METAL SHOPS
Hammers, Chisels, Punches, etc.
FOR AUTOMOBILE SHOPS
Body and Fender Tools, Hammers, Chisels, Punches, Screw Drivers, etc.
FOR MACHINE SHOPS
Hammers, Rules, Chisels, Punches, Levels, etc.
FOR FORGE SHOPS
Anvil Tools, Tongs, Hammers, etc.
Visual Teaching Aids and Project Plans at cost.
STANLEY TOOLS
DIVISION OF THE STANLEY WORKS
Educational Dept., New Britain, Conn.
1843 STANLEY 1943
FOR WOODWORKING AND FARM SHOPS
The most complete line offered by one manufacturer.
FOR ELECTRICAL SHOPS
Hammers, Bit Braces, Bit Extensions, Screw Drivers, etc.

(Continued from page 23A)

with a brush and then ragged off to the desired tone or concentration in an effort to best simulate age or other color effects, *over* dried enamels and lacquers.

Such a wiping glaze can best be made from four ounces of flat varnish, two ounces of boiled linseed oil, and one ounce of pure gum turpentine, all blended together.

To this vehicle is added such pigment colors ground in oil as may best give the desired color range. In any case the color must be kept very thin in body so as to give the effect of translucency rather than opacity. Keep the total effect slightly suggestive rather than dominant.—*Ralph G. Waring.*

News Notes

♦ The Pennsylvania State College, at State College, Pa., is promoting group leadership training classes. The group pictured is one taking such a course at the College. Reading around the tables, from left to right, the individuals are:

H. P. Cassel, Hershey; J. P. Mathias, Hershey; A. M. Hatfield, York; H. B. Herr, York; A. M. Felker, Beavertown; P. D. Wright, State College; Jake DeHoff, York; Clarence Hessler, York; Clair Fitz, Lancaster; Conrad Frank, Hershey; Charles Johnston, Lancaster; D. F. Walters, York; C. A. Shepp, York; F. Theo. Struck, State College; Clarence T. Baab, Greeley, Colo.; S. L. Reynolds, Hershey; Homer Hackman, Hershey; and Frank Attinger, Middleburg.

♦ The booklet, "A Visit to Armco," put out by The American Rolling Mill Co., Middletown, Ohio, and mentioned in the article "Teaching Materials for Industrial Education," by Chris H. Groneman, has been withdrawn from circulation until the end of the war because it includes pictures of the various steel plants of the Company, and identifies their location.

Readers of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION are, therefore, asked not to request copies of this booklet, until after the war.

♦ To help meet the acute shortage of farm labor, courses for the training of farm workers have been authorized by the director of the Rural War Production Training Program at Washington.

The Wisconsin State Board of Vocational and Adult Education, in cooperation with the U. S. Employment Service and the Farm Security Administration, has established courses at Platteville and River Falls. Approximately sixty boys have been recruited from northern Wisconsin farms, and these boys have been sent to the training centers where they will receive instruction in the common jobs upon the farm. Board and lodging are provided at the centers.

♦ The Bureau of Mines of the U. S. Department of the Interior, Washington, has announced two new motion pictures entitled, "Aluminum, from Mine to Metal," and "Aluminum, Fabricating Process."

These are 16mm. sound films and bring to five the total of motion pictures on aluminum. The first is an industrial history of the metal, and the second is a story of its transformation into hundreds of shapes by skilled workers.

♦ Due to a shortage of teachers, industrial-arts

(Continued on page 28A)

Conference leader training group — Pennsylvania State College

CALLING ALL SCHOOLS

UNCLE SAM has for months been emphasizing Industry's urgent need of more trained men and women . . . and calling on schools from coast to coast to enlarge their training facilities to help take care of it.

If your school has all the equipment and supplies needed to do an all-out job — this message is not for you.

But, if you haven't — then we suggest you itemize your needs at once and get your order in while our stock of equipment and supplies still assures prompt deliveries. As national school distributors for scores of leading equipment manufacturers, we are in position to take care of your needs now — but we don't know how long we shall be.

If you need High Speed Drills, Hammers, Chisels, Files, Wrenches, Soldering Irons and other tools and equipment formerly available only on PD-1A forms, make up your order at once, and upon receipt of it we will furnish you with the necessary information on how these can be supplied to you.

If you need lumber — there is plenty of the famous B-G Soft-Textured, Kiln-Dried Lumber — but there are Government restrictions on Yellow Poplar, Mahogany and Plywood, as previously announced to you.

Whatever your needs — check them *at once* and *send your order in today!*

BRODHEAD-GARRETT CO.

"Supplying Defense Training Needs to Schools in All 48 States"

CLEVELAND • OHIO

HOW BERNARD PARALLEL ACTION TOOLS give "More POWER to You!"

1. Parallel jaws exert even pressure over entire length.
2. Compound leverage gives great cutting power.
3. Parallel jaws hold objects without "wedging".

SEND FOR CATALOG
Address: School Supply Division
THE WM. SCHOLLHORN CO
NEW HAVEN, CONN.
Serving Industry for over 75 Years

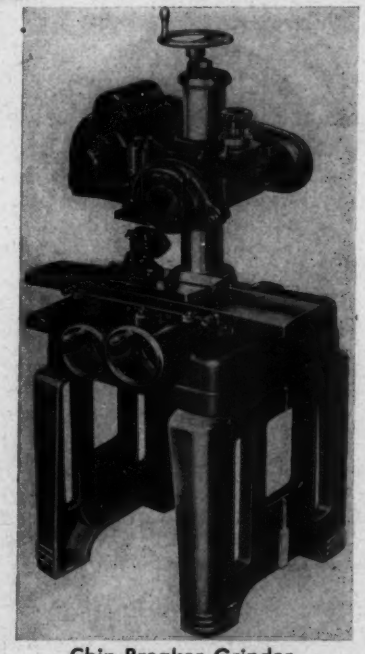
Shop Equipment News

New Products — Publications

NEW CHIP-BREAKER GRINDER

A new low-cost chip-breaker grinder has just been introduced by the Delta Manufacturing Company of Milwaukee. It is designed for grinding the chip-breaker groove in carbide tipped tools, but is also used for grinding form tools, thread chasers, and other units which must be accurately ground. An important feature is the Univise, which holds work at any desired angle. By removing this Univise, the grinder can be used as a surface grinder.

Some of the features of this new chip-breaker grinder are: the Univise for grinding, drilling, and light milling. This is built of four component parts each with a separate circular scale of 360 deg., and each of which can be independently rotated and set; a wheel-mounting arrangement that utilizes a two-piece adapter, so that either wheel, or wheel and adapter, can be removed; a carefully designed spindle, made extra long with widely spaced bearings that provide permanent true alignment; a specially designed column made of one-piece construction, cast of hi-tensile iron, normalized and accurately ground to close tolerances; the means for quick, fine adjustments; and an improved table for smooth operating, with conveniently located control handles.



Chip-Breaker Grinder

Specifications on this Delta Chip Breaker Grinder are: maximum length that can be ground, 13½ in.; maximum width that can be ground, 6 in.; maximum space under 7-in. wheel to table, 9½ in.; maximum space under 7-in. wheel to B. & S. No. 510 magnetic chuck, 6 in.; table surface 5¾ by 13 in.; traverse feed one graduation is .001 in.; maximum adjustment of wheel by means of micrometer is ⅜ in. Each graduation is .0005 in. Minimum diameter cup wheel with standard guard in place, 3½ in.; maximum diameter wheel, 7 in.

For brief reference use IAVE—610.

FINE TEACHING AIDS

The Turner Brass Works, Sycamore, Ill., is publishing some very helpful instruction sheets for blowtorch users in their publication known as "Turner Topics."

To date, three issues are available. No. 1 contains illustrated directions on "How to Light Your Blow Torch." No. 2 is "How to Clean Your Blow Torch," and No. 3 is called "How to Solder."

This little publication may be obtained free for the asking.

For brief reference use IAVE—611.

USEFUL DATA SHEETS

The J. H. Williams & Co., Buffalo, N. Y., manufacturers of drop forgings and drop-forged tools, are offering to send reprints of nine of their full-page ads which have appeared during the past year in INDUSTRIAL ARTS AND VOCATIONAL EDUCATION and other publications, to any instructor who writes for them.

These reprints contain a great deal of very useful information for students in school shops.

For brief reference use IAVE—612.

NEW SOUTH BEND LATHE CATALOG

A new catalog describing the entire line of South Bend engine lathes, toolroom lathes, and turret lathes has just been published by the manufacturer. The engine lathes are made in five sizes ranging from 9 to 16-in. swings. The toolroom lathes are available with swings from 10 to 16 in. The turret lathes are made in two sizes, having 9 and 10-in. swings.

Each size and type of lathe is illustrated and fully described. Specifications are tabulated to facilitate the selection of the lathe required for any desired application. Attachments and accessories for adapting these lathes to special classes of work are also illustrated and described.

Catalog No. 100-C may be obtained from the South Bend Lathe Works, South Bend, Ind.

For brief reference use IAVE—613.

CATALOG OF SPECIAL RACINE METAL SAWS

The new catalog describing Racine's standard line of metal-cutting saws for war-production work, such as shell cutting, rifle cutting, cutting of torpedo flasks, bomb ends, cannon and gun barrel forgings, has just been published by the Racine Tool and Machine Co., Racine, Wis. All Racine saws are hydraulically fed and controlled, and augment Racine's well-known line of Hydraulic Pumps and Valves.

With simple, single lever control, Racine *oil-cushioned* saws have a complete range of feeds for cutting the full run of metals from thin-walled tubing, aluminum, and soft steels through hard steels, special alloy and stainless steel, die blocks, etc. Complete line ranges in capacity from 6 by 6 in. to 20 by 20 in.

For brief reference use IAVE—614.

RADIO CIRCUIT HANDBOOK

A new handbook containing radio and electronic circuits with analyses, comparisons, and discussions, has just been published by Allied Radio Corp., 833 West Jackson Blvd., Chicago, Ill. The price is 10 cents. This book is useful as a text for the classroom, for home study, and as a reliable guide for experimenters and builders. Fundamental principles of radio are illustrated and explained in 16 basic circuits. The application of these principles to various components of receivers, transmitters, and other electronic units is shown in 25 additional circuits of conventional radio and electronic units. A schematic and pictorial diagram is shown for each unit, ranging from simple one-tube sets to superheterodynes.

For brief reference use IAVE—615.

(Continued on page 28A)

TESTORS

CEMENT AND DOPE FOR MODEL AERONAUTICS

FIRST CHOICE OF AMERICA'S MODEL BUILDERS

No. 6 in a Series on Principles of Better Craftsmanship

HOW TO GET A GOOD COVERING JOB

1. Cut the paper roughly to shape for the surface to be covered, leaving ½" to 1" extra all around. Attach the paper first to the main spar, either with drops of cement near both ends, or by a ribbon of cement laid along the spar.

2. Lay a ribbon of cement along the outline pieces of the framework on the surface to which the covering is to be attached. Lift the paper as shown and work quickly. If the frame is large, like a wing, do this a section at a time.

3. Press the paper onto the framework outline all around, so the cement penetrates the paper and bonds it firmly to the frame. Use your fingers to draw the paper firm in all directions and to smooth out all wrinkles. Work rapidly and carefully.

4. When the cement has set, blow a light, even spray of water over the covered framework, just enough to moisten the paper. When this dries, the paper will draw tight and, if the preceding operations have been done right, give a perfect job.

You will find these practical data sheets a helpful guide for your classes. May we suggest that you save and file the entire series.

Now! Get complete details about Testor's Model Airplane Cements and Dopes

TESTOR CHEMICAL CO., ROCKFORD, ILLINOIS, U.S.A.

(Continued from page 26A)

A COURSE IN CAMOUFLAGE

A series of lessons entitled "Color in Camouflage," will be available shortly from the Eberhard Faber Pencil Co., 37 Greenpoint Ave., Brooklyn, N. Y. This portfolio is designed expressly for classroom use, and these progressive charts present an easy, concise approach to the use of camouflage art for military and civilian protection.

The series was developed by Professor William A. Rose and Mr. Robert Lee Corsbie, graduates of the Army Engineers' Camouflage School at Fort Belvoir, Virginia. At New York University they jointly conduct courses in Basic and Advanced Camouflage.

The choice and use of essentially correct colors are illustrated and discussed. Teachers of accredited high schools and art schools are invited to send for the new portfolio free. Teachers who write for this portfolio are asked to give the name of the school to the Eberhard Faber Pencil Company.

For brief reference use IAVE—616.

NEWS NOTES

(Continued from page 24A)

seniors at the State Teachers College, California, Pa., are doing their student teaching as regular shop instructors. They are paid the wages of the shop instructors in the positions in which they serve. Reports of the work done by these student teachers have revealed that they have done a commendable job in each instance.

An important result of the plan is the number of shops which are kept open for preinduction training due to the fact that these student teachers were able to assume the assignments given them.

♦ The Graduate Library School, of the University of Chicago, is offering two full-tuition $300 scholarships and two half-tuition $150 scholarships for the academic year 1943–44 to students enrolled in the basic curriculum leading to the bachelor of liberary science degree. The scholarships which are being offered in addition to the fellowships, are two in number. One is for students with a bachelor's degree and pursuing a one-year program of basic courses in library techniques; the other is for students with two years of college and pursuing a three-year program, including two years of preprofessional courses in subject fields followed by one year of basic library courses.

♦ The annual open house of the graphic-arts department was held at the State Teachers College, California, Pa., on January 14, in connection with National Printing Education Week.

The entire shop was in full operation during the entire evening. Students carried on the various activities of the shop in order that visitors might see the work being done in the department. Some of the operations included monotyping, keyboarding, hand composing, blueprinting, marbling, presswork, paper cutting, perforating, bookbinding, dry point etching, and silk-screen work.

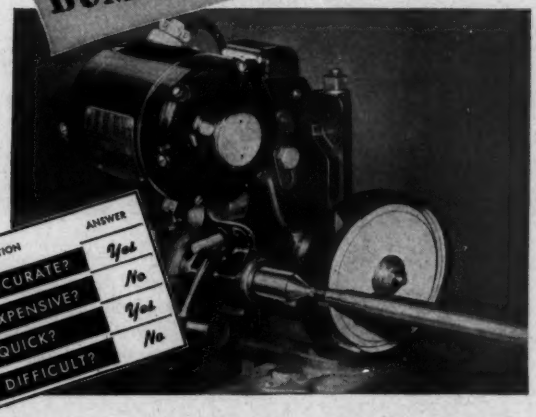
Thread Grinding Simplified

WITH DUMORE GRINDERS

Grinder mounts on special post with lugs for quill and graduations for helix angle.

Here is the set-up, as seen from back of lathe. Motor is up and back from work.

Arrow shows graduated arc for setting wheel dresser to same helical angle as grinder.



Any lathe that can cut threads becomes a thread-grinding machine by replacing the chasing tool with a Dumore No. 5 Grinder equipped with thread-grinding attachment. You can cut threads from solid stock, finish threads already roughed out with cutting tools, or correct threads distorted by hardening . . . all within the regular Dumore tolerance of .0001". ★External threads are limited only by the pitch and diameter the lathe will handle. Internal threads, in wide range of depths, pitches and diameters can be ground using Dumore internal quills. This time-saving, machine-saving system is a simple set-up with mathematically accurate adjustment of helix angle, plus an equally accurate device for diamond-dressing the wheel. ★ Enjoy the versatility of the Dumore No. 5 Grinder . . . when you've finished your threading jobs use it for fast and accurate cylindrical, taper, and flat grinding on lathes, boring mills, planers and other machine tools.

Dumore

THE DUMORE COMPANY
DEPT. 233F RACINE, WISCONSIN

PRECISION GRINDERS

7 SIZES . . . 54 QUILL COMBINATIONS

New Publications

Quiz Questions to Accompany French's Engineering Drawing

By John M. Russ. Paper cover, 42 pages, 6 by 9 in. Price, 25 cents. Published by McGraw-Hill Book Co., New York City.

This booklet will be found a valuable teacher's aid by those who use this drawing text.

Wells' Manual of Aircraft Materials and Manufacturing Processes

By T. A. Wells. Cloth, 212 pages, 7½ by 10⅛ in. Price, $3.50. Published by Harper & Brothers, New York, N. Y.

This book was designed to give the aircraft mechanic and the learner an understanding of how and of what aircrafts are constructed.

Part I gives information about such materials as aluminum and magnesium alloys, steel, nonferrous metals, wood, rubber, plastics, and the finishes used.

Part II covers welding, heat-treatment of metals, cutting, forming, machining operations, riveting, cleaning, and corrosion proofing. The machining and gluing of wood also is discussed in Part II.

Using Tools

By Orlo M. Shultz. Paper, 123 pages, 8½ by 10¾ in., illustrated. Published by Florida Curriculum Laboratory, University of Florida, Gainesville, Fla.

This book is one of a series written for use in schools of rural communities. It is designed for the intermediate grades.

It describes the use and care of the ordinary tools, and shows how these tools can be used in the making of screens, window shelves and boxes, model rooms and houses, footstools, and similar projects. Simple weaving and the making of cement bricks also is explained.

The Machine Tool Primer

Cloth, 277 pages, 7 by 10⅜ in., illustrated. Written and published by the Herbert D. Hall foundation, 1060 Broad St., Newark, N. J.

A well-illustrated introduction to the tools used by those working in the metal industry.

It is divided into two parts. The first part describes the things made by machine tools, the general processes, mass production, skills required, inspection and gauging methods used, tooling up for production, and time and motion studies.

Part Two describes the machine tools, such as: drilling machines, lathes, turret and automatic

lathes, planers and shapers, milling machines, grind machines, and punch and forming presses.

Printing Shop Mathematics

By Herbert D. Harper. Cloth, 127 pages, 6 by 9¼ in., illustrated. Price, $1.50. Published by D. Van Nostrand Co., New York, N. Y.

This book prepares the student to take care of the mathematics applied especially to problems arising in the daily work of the printer.

It is divided into ten chapters which present the work under the following headings: lay of the case, justification, print-shop measurements, type calculations, art work, paper, stonework and imposition, binding, ink, and estimating.

Motor's Truck Repair Manual

Cloth, 905 pages, 8½ by 11 in., illustrated. Price, $7.20. Published by Motor, the Automotive Business Magazine, 572 Madison Ave., New York, N. Y.

This book gives the manufacturer's own service data on overhauling and repairing the different makes and models of trucks built from 1936 to 1942. It contains step-by-step instructions for the different kinds of jobs. There are 170 pages of tables of clearance and adjustment specifications.

In it are covered: air cleaners, automatic chokes, axles, brake systems, carburetors, clutches, Diesel pumps and injectors, engines (Diesel and gasoline), gauges, generators, governors, head lamps, ignition systems, magnetos, oilfilters, transmissions, shock absorbers, starting motors, switches, steering gears, universals, and windshield wipers.

A Bibliography of Motion Pictures

Compiled by Gilbert G. Weaver. Paper, 329 pages, 8¾ by 11 in. Price, $2 for readers of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. Regular price, $2.50. Published by The Hamilton Company, 225 Lafayette St., New York, N. Y.

Practical Hints for the Use of Motion Picture Films in Vocational and Technical Education

By Gilbert G. Weaver. Paper, 44 pages, 8½ by 11 in. Price, $1. Published by The Hamilton Company, 225 Lafayette St., New York, N. Y.

The bibliography lists, classifies, and describes approximately 2000 motion-picture films, slide films, and slides.

It is especially compiled for the training departments of vocational and technical schools.

The book on practical hints describes the kinds of projected pictures commonly used, the advantages derived from using them for teaching, the characteristics of the various types of projected pictures, suggestions on how to use each most effectively, how to prepare for showing a picture, and how to evaluate the results of the presentation.

Industrial Production Illustration

By Randolph P. Hoelscher, Clifford H. Springer, and Richard F. Pohle. Paper, loose leaf, 172 pages, 9⅞ by 11¼ in. Price, $3.50. Published by McGraw-Hill Book Co., New York, N. Y.

The authors have tried to cover not only perspective, but the entire range of pictorial drawing. Present-day industrial drawing-room practice, especially in war-production work, resorts to pictorial drawings to an increasing extent, and this text covers the many types used to a surprising extent.

Its chapters treat the subject under the following headings: uses of pictorial drawing, orthographic projections and sketching, axonometric projections and sketching, oblique projection and sketching, perspective, and shading. The book is well illustrated.

Pre-Service Course in Automotive Mechanics

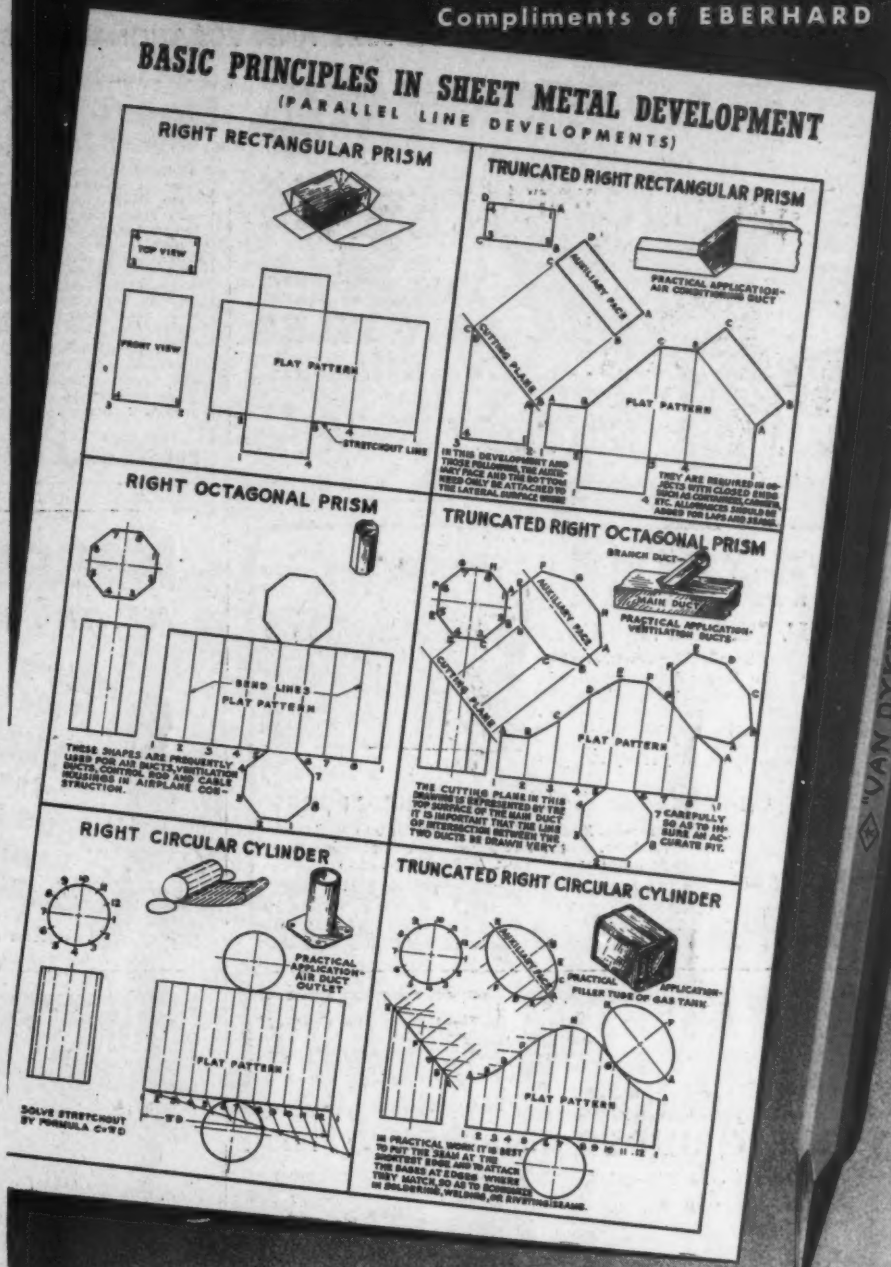
By James V. Frost. Cloth, 545 pages, 5¾ by 8⅝ in., illustrated. Price, $1.96. Published by John Wiley & Sons, New York, N. Y.

A one-year high school course to serve for preinduction classes. The material is divided into nine chapters which present the matter under the following headings: the motor vehicle; chassis, running gear, and body; power unit; power train; cooling system; fuel system; electrical system; lubrication; and safety.

(Continued on page 31A)

SEND FOR THIS SPECIAL CHART

Compliments of EBERHARD FABER



Special Stimulation

To help stimulate and promote interest in one of today's most sought after subjects Eberhard Faber offers to teachers of Mechanical Drawing a large size wall chart on the BASIC PRINCIPLES IN SHEET METAL DEVELOPMENT. This chart illustrates studies in parallel line developments, as they apply to aircraft design, layout, lofting and fabrication. . . . MICROTOMIC VAN DYKE Drawing Pencils, famous in professional circles, will help the student achieve his highest skill.

EBERHARD FABER

Free!

LEADERSHIP IN FINE WRITING MATERIALS SINCE 1849

EBERHARD FABER PENCIL CO., Educational Dept., 37 Greenpoint Ave., Brooklyn, N.Y.

Please send, without cost, Chart No. 3 on "Basic Sheet Metal Development".

Name_____

School_____

Address_____ City_____

SAW FILING

For schools training Defense workers, the Foley Filer keeps saws in tip-top shape, faster and better than hand filing. Used by Army, Navy, N.Y.A. Schools, hundreds of manual training departments and industrial plants. The

FOLEY AUTOMATIC SAW FILER

is the only machine that files and joints all hand, back and mitre box saws from 3 to 16 points per inch, cross-cut circular saws up to 16" diameter. (24" optional), and band saws up to 24' long.

SOLD ON 30 DAY TRIAL. Send for our booklet giving full details on new Model F-16 with many advanced features.

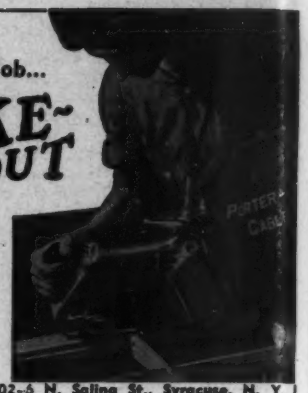
FOLEY MFG. CO., 18 Main Street, N. E., Minneapolis, Minnesota

---

Teach Them With The SANDER They'll Use on the Job...

● Here's the sander your students will most likely use on busy production lines. It is the acknowledged leader in its field. Practical workmen prefer TAKE-ABOUT'S sustained power and high speed that assure sharper, faster cutting. They like its perfect balance that contributes to the "craftsman touch," that vital factor in expert work.

TAKE-ABOUT



TAKE-ABOUT pays its own way on refinishing desks, table tops, blackboards and in doing other maintenance jobs. Write for details and complete list of important features.

PORTER-CABLE MACHINE CO., 1702-6 N. Salina St., Syracuse, N. Y.

RACINE

METAL CUTTING MACHINES

Standard for Higher Quality—Greater Precision

Embody the latest developments in machine tool design. "Utility" Saws in Wet or Dry Cut models. Capacity 6"x6". For general purpose cutting. Simple Hydraulic Feed and Control—anyone can operate. Complete, ready to operate. Low in price.

STANDARD FOR QUALITY AND PRECISION

RACINE *Variable Volume* HYDRAULIC PUMPS

A Modern Source of Hydraulic Force — Capacities 0 to 30 G.P.M. —up to 1000 lbs. oil pressure per sq. in. Complete information gladly furnished on request. Address Dept. IA-S

RACINE TOOL AND MACHINE CO.
RACINE, WISCONSIN

MARQUETTE

REG. U.S. PAT. OFF.

A.C. ARC WELDERS

MARQUETTE MFG. CO., INC. MINNEAPOLIS, MINNESOTA

BALDOR

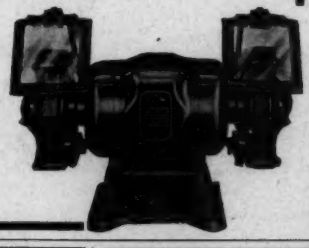
BALL BEARING **GRINDERS**

The COMPLETE LINE of BALDOR Grinders (bench and pedestal types) described in BULLETIN 307 Ask for it.

THIS GRINDER *Guaranteed 2 Years against Burn-out*

BALDOR GRINDER No. 612 has Capacitor Type ½ HP Motor guaranteed 2 yrs. against burn-out. 3400 r.p.m. 110 volt. 60 cy., single phase. 6" x ¾" wheels; enclosed guards; adjustable eye shields and tool rests.

Net weight, 61 lbs. **$33.50**



BALDOR ELECTRIC CO.
4325 Duncan Ave., St. Louis, Mo.

YOU NEED THIS GREAT BOOK!

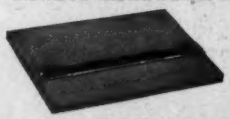
Indispensable for all Teachers and Students of Radio

Recognized and endorsed by radio experts, teachers, and all interested in radio, as one of the most practical, helpful, and authentic radio text books yet written.

J. Douglas Fortune's book is authoritative, readable, understandable! It covers everything from learning the code, on through receiver theory, the actual building of transmitters, modulator... etc. etc. right on to complete reference chapter explaining in detail most minute operations. A really indispensable book for pre-induction training! Beautifully bound in cloth—over 150 pages—post-paid for only 75c... or at bookstores. Special prices on quantity purchases by teachers.

THORDARSON ELECTRIC MFG. CO.
502 WEST HURON STREET • CHICAGO, ILL.

HOW TO IMPROVE MECHANICAL DRAWINGS



More and more of the nation's leading universities, High Schools and Vocational Schools are demanding that drafting students use ESCO Drawing Kits. Why?—Because the ESCO Method is more accurate, more economical, more professional, easier to use and produces neater drawings than the old-fashioned board and T-Square.

The ESCO Scholastic Kit is COMPLETE—it consists of an extra fine, specially constructed basswood drawing board, built-in parallel ruling device and laminated Bakelite straight-edge either with or without transparent edges; available in seven sizes—12" x 17", 16" x 21", 16" x 22", 18" x 24", 20" x 24½", 20" x 26", 23" x 31".

Write for full particulars and catalog on ESCO Drafting Equipment.

Engineering Sales Company
Dept. 1042 720 Clara Ave. Sheboygan, Wis.

TOOLS ALWAYS SHARP with PLURALITY OILSTONE TOOL GRINDERS

Now available in 3 sizes
No. 425 Plurality Sub Jr.
No. 450 Plurality Jr.
No. 475 Plurality

No. 450 Plurality Jr.

Grinding can be done on a cone, coarse or fine oilstone, leather stropping or emery wheels. Unit is compact, efficient, serviceable, easily accessible and has ball bearing direct motor drive. Especially guarded for school shop use. Details on request.

Mummert-Dixon Co. Hanover, Pa.
Originators and Pioneer Manufacturers of Oilstone Tool Grinders

---

PRACTICAL SCHOOL SHOP JOINTER

H and A 6" Jointer, extra long tables, 42" overall, rabbetting type, automatic safety guard adjustable tilting fence, three knife round safety head, ball bearing boxes, made entirely of sand cast iron parts, free of die castings, ½ H.P. single phase motor, 110 volt, starter, bench type as shown.....$102.00
Cast iron floor stand mounted..... 118.00

Send for large circular.

WOODWORKERS' TOOL WORKS
224 S. Jefferson Street Chicago, Illinois

FIRST and FINEST
HANDEE

TOOL OF 1001 USES

Does precision work on metals, alloys, plastics, wood, horn, bone, glass, etc. Original tool of this type and the favorite today.

A WHOLE TOOLSHOP IN ONE HAND

Uses 300 accessories to grind, drill, polish, rout, cut, carve, sand, saw, sharpen, engrave. Plugs in any socket. Wt. 12 oz. 25,000 r.p.m. *$18.50* postpaid with 7 Accessories.

EVERY VOCATIONAL SCHOOL NEEDS THIS ULTRA DE LUXE SET

Strong, metal carrying case contains a DeLuxe model Handee and 45 of the most popular and most practical accessories. It's a good idea to begin with this set and then add accessories as needed.

Postpaid, *$25.00.*

ORDER on 10-DAYS MONEY-BACK TRIAL

FREE—64-page Catalog describes all Handee Products and their wide application in crafts and industry all over the world.

CHICAGO WHEEL & MFG. CO.

1101 W. Monroe Street Dept. IA Chicago, Illinois

100's Industrial Arts Teachers Needed
For Good Paying Positions
Throughout the West and Middle West
FREE ENROLLMENT
Largest In The West
Wm. Ruffer, Ph.D., Manager

ROCKY MT. TEACHERS AGENCY
410 U.S. Nat. Bank Bldg. Denver, Colo.

BASIC BENCH-METAL PRACTICE
J. W. GIACHINO AND JOHN L. FEIRER
ORDER ON APPROVAL TODAY
THE MANUAL ARTS PRESS
PEORIA, ILLINOIS

(Continued from page 29A)

An appendix containing various tables and sundry bits of useful knowledge, together with a glossary, add to the usefulness of the book.

The Story of Western Pines

By Western Pine Association, Portland, Ore. Paper, 64 pages, 5¼ by 7⅜ in., illustrated. Primarily for use in seventh, eighth, and ninth grades; single copy free.

An instructive little treatise describing some of the history of the use of these pines from the very earliest pioneer days down to the present time.

The booklet also describes where western pines grow, how forest conservation is practiced, how fires and tree maladies and destructive insects are fought, and how logging and marketing is done.

Index to Handicrafts, Modelmaking, and Workshop Projects Supplement

Compiled by Eleanor Cook Lovell and Ruth Mason Hall. Cloth, 527 pages, 5¾ by 8¾ in. Published by F. W. Faxon Company, Boston, Mass.

A supplement to a previous volume by the same name. The present volume covers the literature on this subject from 1936 to 1941.

Extensive references from the following periodicals are included in the index: *Deltagram;* INDUSTRIAL ARTS AND VOCATIONAL EDUCATION; *Mechanics Illustrated; Model Craftsman; Model Engineer; Model Engineer and Practical Electrician; Modern Mechanix; Modern Mechanix (Hobbies) and Inventions; Popular Homecraft; Popular Mechanics; Popular Science;* and *Woodworker.*

Principles of Electricity

By Wendell H. Cornetet and Daniel W. Fox. Paper, 255 pages, 6⅝ by 10⅛ in., illustrated. Price, $1.60. McKnight & McKnight, Bloomington, Ill.

The material in this book covers the broad field of elementary electricity and magnetism in quite a comprehensive way.

The informational part of each lesson is accompanied by directions for definite things which the student must do. Then there also are questions of the objective examination type, which show what the student knows after he has finished the lesson.

The Marine Power Plant

By Lawrence B. Chapman. Cloth, 401 pages, 6¼ by 9¼ in., illustrated. Price, $4. Published by McGraw-Hill Book Co., New York, N. Y.

This is the second edition of this book, which aims to present to the student the thermodynamics of the various types of marine power plants.

The book is divided into 13 chapters in which are treated fuels, boilers, combustion, reciprocating steam engines, geared turbines, turbo-electric drives, Diesel engines, condense and condenser auxiliaries, feed-water systems, power-plant layouts, and the computations for the power plant of a merchant ship.

There also is a chapter devoted to comparing the various types of propelling machinery.

How to Draw Comics and Commercial Art

By Gene Byrnes. Paper boards, 64 pages, 10 by 12 in., illustrated. Price, $1.50. Published by Bridgman Publishers, Inc., at Pelham, N. Y.

A complete course in cartooning, written by a successful cartoonist whose comic strips have delighted old and young for many years.

The illustrations are superb and carry the punch which one would expect from the originator of "Reg'lar Fellars."

How to Get a Job

By Mitchell Dreese, Dean of the Summer Sessions, The George Washington University. Published by Science Research Associates, 1700 Prairie Ave., Chicago, Ill.

Household Workers

By Jean Collier Brown, Women's Bureau, U. S. Department of Labor. Published by Science Research Associates, 600 South Michigan Ave., Chicago, Ill.

These are a few of the "easy-to-do" projects in

YOU CAN WHITTLE AND CARVE

By Amanda Watkins Hellum
and
Franklin H. Gottshall

There's something challenging about a small block of soft wood that makes the fingers itch to start whittling away at it. You and your industrial arts students can really have fun turning out all kinds of amusing and artistic little carvings by following the simple directions and graphic illustrations in YOU CAN WHITTLE AND CARVE.

Once you have a sharp knife in one hand and a "blank" of wood in the other, you are ready to begin any of the projects in the books. And it won't be many chips later before an attractive wall plaque, an animal figure, or a pair of artistic bookends will begin to take shape. Complete directions and full-size detail drawings guide you in making your carving perfect down to the sixteenth of an inch. Actual size photographs clearly show the various stages in the carving process.

Among the novel articles you can whittle and carve are wall plaques, bookends and serving trays, jewelry, and delightful animal and human figures so real-looking that they almost seem to breathe.

Best of all, you and your students need only an ordinary pocketknife and a piece of scrap wood for most of the projects in the book, although additional tools are suggested for finer work. $2.25

Use the coupon to get YOUR copy of this new book on 5 days' approval from

THE BRUCE PUBLISHING CO.
706 Montgomery Bldg.
Milwaukee, Wis.

BRUCE—MILWAUKEE: Please send me on 5 days' approval .... copies of your new craft book, YOU CAN WHITTLE AND CARVE, $2.25.

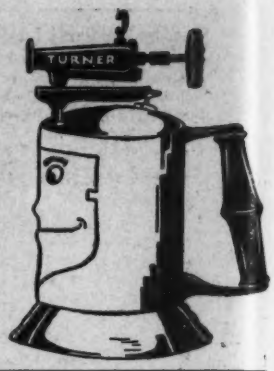
Name Position
School
Address
City and State I.A.V.E. 6

Detroit Public Library

Sterling
FOUNDRY FLASKS
Famous for their rigidity and accuracy. Made of rolled steel, one-piece channel with solid center re-inforcing rib and square flanges. Full width bearing. Write for catalog.
STERLING WHEELBARROW CO.
Milwaukee, Wis., U.S.A.

The Same
DEPENDABILITY
Year After Year
Catalog free to Instructors
FRANK PAXTON LUMBER CO.
DES MOINES DENVER
FORT WORTH KANSAS CITY

Free
"HOW TO SOLDER"
In Turner Topics No. 3, now ready, Torchy Turner shows "How to Solder" in step-by-step action pictures. Send your post-card request to Dept. VE:
TURNER BRASS WORKS
Sycamore, Illinois



THE METAL CRAFTS
are somewhat curtailed in school programs but we can still help you by supplying small tools and supplies.
Catalog IA sent to teachers of Industrial Arts who specify school connection.
Metal Crafts Supply Co.
10 Thomas St. Providence, R. I.

● Headquarters for quality leathercraft materials . . . for America's camps, summer schools, play clubs and playgrounds. Always a complete stock of Leathers, Tools and accessories ready for immediate shipment. Attractive prices. We supply everything needed. Special WAR CATALOG, 64 pages of leathers and tools with patterns and instructions for worthwhile projects now ready for instructors.
Write today for Catalog No. 14.
OSBORN BROTHERS
223 W. Jackson Blvd., Chicago, Ill.

"HOLD-HEET" GLUE POTS
are Standard in School Shops!
They're safe, fool-proof, built "like a boiler" to take plenty of shop abuse. Automatic Thermostat controls glue temperature; no burned or spoiled glue; no water jacket troubles; no fire hazards. PLAY SAFE —teach students modern, safe gluing methods with this superior "Hold-Heet" Electric Glue Pot—used by industry and schools everywhere!
1 qt. $14 4 qt. $24
2 qt. $17 8 qt. $36
115 or 230 Volts

RUSSELL ELECTRIC COMPANY
364 W. Huron St., Chicago, Ill.

STA-WARM TRIPLEX
3 Heat Glue Pot
A low cost, high efficiency quality Electric Glue Pot with 3 heating control —
1. Low—for intermittent use.
2. Med.—for continuous use.
3. High—for quick heating.
Write for details on its 17 advantages.
1 pt. - $6.75
1 qt. - 7.25
2 qt. - 9.25
Details also available on other Sta-Warms, 1 pt. to 8 qt., with automatic control.
STA-WARM ELECTRIC CO., Ravenna, Ohio
Rep. by Oliver Machy. Co., Gr. Rapids, Mich.

TOOLS AND SUPPLIES **CABINET HARDWARE**
We will gladly supply whatever materials and tools we still have available. Be sure and include highest priority rating possible with each order.
Lussky, White & Coolidge, Inc.
216 W. Monroe Street Dept. C-6 Chicago, Illinois

ELECTRIC
MOTOR PARTS
FOR ALL MAKES
ALSO ALL MATERIALS AND TOOLS USED IN THE MOTOR REPAIR SHOP
Free Catalogue to Instructors
READING ELECTRIC CO., Inc.
200 William St., New York

Electro-Typers
Especially qualified to be of service to the school printshop.
Promptness and quality assured.
Forms returned same day received.
Badger - American Electrotype Co.
600 Montgomery Bldg.
407 East Michigan St., Milwaukee, Wis.

LOOMS, Table and Foot
Reed, Raphia, Handicraft Supplies
Send for catalog
J. L. HAMMETT CO.
CAMBRIDGE, MASS.

Materials for Brush Making
Brush Fibres, Tampico, Fibre Mixtures, Sterilised Horse Hair. Hair, Bristle and Tampico mixtures solid or taper stock, original lengths cut to size. *Samples matched.*
E. B. & A. C. WHITING CO.
Burlington, Vermont

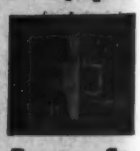
Archery Materials
The L. C. Whiffen semi-finished 5 foot 8 inch lemonwood bows pulling up to 40 pounds have proved their excellence for use as an educational and useful project. . . . Send for a trial set. You will be enthusiastically surprised.
Complete Set Bow—6 arrows Semi-Finished $1.98

L. C. WHIFFEN CO., Inc.
828 W. Clybourn St. Milwaukee, Wis.

LUMBER
FOR SCHOOL SHOPS
Our 50 years of experience in marketing lumber is your assurance of a service hard to duplicate. 65% of our lumber is under shed. We can supply all your requirements for lumber, saving you time and money.
The Tegge Lumber Co.
3500 W. Bruce St. Milwaukee, Wis.

LUMBER FOR SCHOOLS
T. A. FOLEY LUMBER CO.
PARIS, ILL.

Heat Treating Furnaces and Equipment
FORGES—gas fired, no smoke or dirt. Sizes from the bench type at right to large floor models.
MELTERS—for aluminum, brass, lead, gold, etc., many sizes and types.
We also supply Ovens, Salt Baths, Complete Shop Tables — Blowpipes, Burners Etc.



American Gas Furnace Co.
Elizabeth, N. J.

We manufacture a complete line of equipment:
COLLEGE GLASS working units for students and laboratory. SPOT WELDERS and A. C. ARC WELDERS. TRANSFORMERS, special and standard types. INCANDESCENT LAMP manufacturing equipment. RADIO TUBES, ex-ray, cathode ray, photo cells. ELECTRONIC EQUIPMENT, vacuum pumps, etc. NEON UNITS, blow torches and burners of all kinds. GENERAL GLASS working machines and ribbon burners.
EISLER ENGINEERING CO.
CHAS. EISLER
767 So. 13th St. (Near Avon Ave.) Newark, New Jersey

HIGGINS AMERICAN DRAWING INKS

Precision Inks for Precise Performance

It is not fantasy when we say this night fighter including engine, propeller and instruments was built from plans drawn with Higgins American Drawing Inks. It may have been assembled from isometric drawings made with Higgins Ink in a building erected from plans drawn with Higgins Ink and its parts were made with machine tools built from Higgins Ink designs. It takes off from an air field plotted and mapped with Higgins Ink. It lands by a radio beam from a sending apparatus the parts of which were planned with Higgins Ink and so on endlessly.

When so much depends on quality, we are proud to state that millions of users agree "Higgins" is the undisputed champion of precise performance.

AVAILABLE IN A COMPLETE COLOR RANGE

HIGGINS INK CO., INC.
271 NINTH ST.
BROOKLYN, N. Y.

Teach Practical ARC WELDING with HOBART "Simplified" Arc Welders

One of the most widely used welders in industry today

Exclusive Features Make Hobart Most Modern Equipment

Here's a versatile welder that will let you teach with greater ease; give your students finest features to be found. Simplified operation assures simplified teaching and learning. New manuals outline latest methods, procedures, techniques and materials. Even outlines proper sequence of lessons. You'll want a copy, and so will every one of your students. Special school prices on "Lessons" Book. Write.

☐ Send data on Welders.
☐ "Practical Arc Welding" $2.50, postpaid.
☐ "Lessons" Book 75c, postpaid.

HOBART BROS. CO., Box IAV-112, Troy, O.

High Grade
Printing Inks

For SCHOOL PRINT SHOPS

COVERWELL INKS FOR QUALITY PRINTING

MARTIN DRISCOLL & CO.
610 Federal St. Chicago, Ill. | Portland, Oregon | 407 E. Michigan St. Milwaukee, Wis.

MEND-ALL Woodforming Plastic

is canned wood which can be molded by hand, knife, or other tools. After hardening, can be sawed, tooled, turned, or whittled. Will not crack or split. Holds screws and nails and can be sanded, painted, stained or varnished. Water and crack proof. Excellent for filler work.

Ideal for School Shop Use.

Write for literature and prices today.

Other Mend-All products: liquid hide glue . . . Mend-All Water resistant casein glue, Waterproof transparent cement. For literature and prices write to

GILL PRODUCTS CO., INC.
305 Wisconsin Tower, Milwaukee, Wis. | 168 W. 23rd Street, New York City

INDEX TO ADVERTISEMENTS

Adjustable Clamp Company 10A
Allied Radio Corp. 34A
American Gas Furnace Co. 32A
American Technical Society 8A
Armstrong Bros. Tool Co. 4A
Atkins and Company, E. C. 11A
Atlas Press Company, The 6A
Badger-American Electrotype Co. 32A
Baldor Electric Company 30A
Black & Decker Mfg. Co., The 3A
Brodhead-Garrett Co. 25A
Bruce Publishing Company, The 17A, 31A, 34A
Burrill Saw & Tool Works 10A
Campbell Co., M. L. 12A
Carborundum Company, The 5A
Chicago Wheel & Mfg. Co. 31A
Cincinnati Tool Company, The 8A
Columbian Vise & Mfg. Co. 13A
Delta Mfg. Company 21A
Dixon Crucible Co., Joseph ..... 3rd cover
Driscoll & Co., Martin 33A
Dumore Company, The 28A
Eberhard Faber Pencil Co. 29A
Eisler Engineering Co. 32A
Engineering Sales Company 30A
Foley Lumber Company, T. A. 32A
Foley Manufacturing Co. 30A
General Finishes Sales & Service Co. 22A
Gill Products Co. Inc. 33A
Guillow, Paul K. 22A
Hammett Company, J. L. 32A
Heller Bros. Company 20A
Higgins Ink Co., Inc. 33A
Hobart Brothers Company 33A
Kempsmith Machine Company ..... 2nd cover
LeBlond Machine Tool Co., R. K. ..... 4th cover
Lee Co., K. O. 2A
Lewis Machine Tool Co. 12A
Lufkin Rule Company, The 10A
Lussky, White and Coolidge 32A
Manual Arts Press 31A
Marquette Manufacturing Co. 30A
McGraw-Hill Book Co., Inc. 13A
McKnight & McKnight 22A
Metal Crafts Supply Co. 32A
Millers Falls Company 13A
Morgan Vise Company 6A
Mummert-Dixon Co. 30A
Nicholson File Company 14A
Oliver Machinery Co. 8A
O'Neil-Irwin Mfg. Company 10A
Osborn Bros. 32A
Paxton Lumber Co., Frank 32A
Peerless Machine Company 23A
Pennsylvania State College, The 22A
Porter-Cable Machine Co. 30A
Racine Tool & Machine Co. 30A
Reading Electric Company, Inc. 32A
Red Chief Industries 34A
Rhodes Mfg. Co. 6A
Rocky Mt. Teachers Agency 31A
Ruby Chemical Company 12A
Russell Electric Company 32A
Russell-Jennings Mfg. Co. 11A
Schollhorn Co., Wm. 26A
Sheldon & Company, E. H. 8A
Sheldon Machine Co., Inc. 4A
Skilsaw, Inc. 9A
South Bend Lathe Works 1A
Stanley Electric Tool Div. 4A
Stanley Tools 24A
Star Paper Fastener Co. 34A
Starrett Co., L. S. 18A
Sta-Warm Electric Co. 32A
Sterling Wheelbarrow Co. 32A
Tannewitz Works, The 2A
Tegge Lumber Co., The 32A
Testor Chemical Company 27A
Thordarson Elec. Mfg. Co. 30A
Turner Brass Works, The 32A
Union Carbide and Carbon Corp. 19A
Walker-Turner Co., Inc. 7A
Wallace Company, J. D. 11A
Weber Company, F. 22A
Weidenhoff, Inc., Joseph 6A
Western States Envelope Co. 12A
Whiffen Co., Inc., L. C. 32A
Whiting Co., E. B. & A. C. 32A
Williams and Co., J. H. 2A
Woodworkers' Tool Works 30A
Yates-American Machine Co. 16A

EVERYTHING YOU NEED for WAR TRAINING in RADIO and ELECTRONICS

USE THE NEW ALLIED CATALOG
Most Complete Up-to-Date 1943 Buying Guide
FREE!

Radio training specialists in Allied's Educational Division help you plan and carry out your training projects. The new, *free* 1943 Allied Buying Guide gives you the latest information on books, diagrams, kits, tubes, tools, test equipment, public address . . . everything in Radio and Electronics to meet every radio training need in the classroom, laboratory or shop. Write our Educational Division.

★ USE THESE VALUABLE TRAINING AIDS

Priced only to cover cost of handling and mailing

Radio Formulas and Data Book No. 37-752—10c
Dictionary of Radio Terms No. 37-751—10c
Radio Circuit Handbook . . . No. 37-753—10c
Radio Builders Handbook . . . No. 37-750—10c
Simplified Radio Servicing . . . No. 37-755—10c

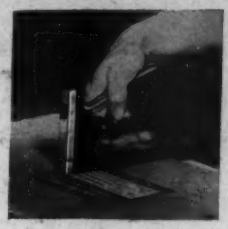
Write for quantity quotations

ALLIED RADIO CORP.
833 W. Jackson, Dept. 41-F-3, Chicago

ALLIED RADIO ★

★ ★ ★ ★ ★ ★ ★ ★ ★

Investigate these Star Tools



STAR AUTOMATIC TACKERS

The Best Way to Tack Things

Used in industrial production work. Tack upholstery, wire screens, shades on rollers, dozens of other uses. Easy to operate—just squeeze the handle. Hold material in place with one hand, tack it with the other. Tack within 1/16" of an edge and in close quarters where you can't swing a hammer.

Use inexpensive staple tacks.
List Price $6.00
Write for special offer to readers of this magazine.

STAR Model S122P Stapler

A stapler and light tacker combined. Handy—fits in pocket. Squeeze it to staple papers—Holds 105 Standard Staples.

USED AS A TACKER

Swing the base down and around and it becomes a light duty tacker. Fine for tacking up charts, pictures and papers on walls, drawings on drawing boards. List Price $1.90

Write for special offer to readers of this magazine. Send for catalog of the Star line of tackers and paper fasteners.

★ Star Paper Fastener Co.
NORWALK Dept. AE CONNECTICUT

★ ★ ★ ★ ★ ★ ★ ★ ★

DECALS! AIRPLANE INSIGNIAS

Pep Up Plane Projects!

BIG Flag Decal FREE!

Stimulate more interest in plane building! Boys everywhere enthuse about these bright, FULL COLOR Squadron Insignias. Authentic, official designs of U. S. Air Corps. Lively, attractive. Genuine Decals. Soak 'Em—Slide 'Em —Stick 'Em for Permanent wear. 6 pairs (12 decals) 1" size all for 10c. Also come in 1½" size, 12 for 15c. 180 different sets (12 decals each). Over 1000 designs available both sizes. Please send coin, currency or money order. No stamps.

BIG HANDSOME FLAG DECAL (or V for Victory design) both 7½x11 for your classroom, included FREE with each order over $2.50. Illustrated literature showing all insignia designs sent on request.

ALSO
New Official High School Victory Corps Insignia Decals

RED CHIEF INDUSTRIES
Dept. VA-6 2326 S. Michigan • Chicago

SCHOOL-SHOP ADMINISTRATION

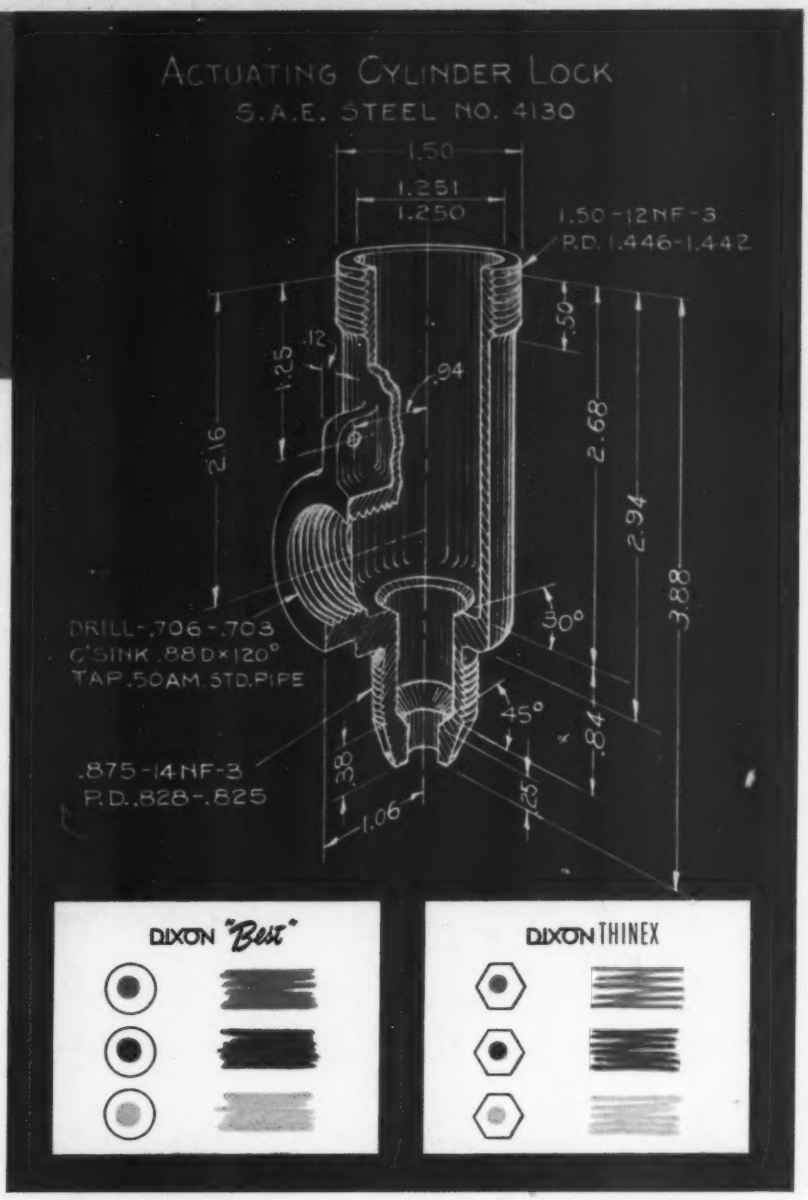
By Arthur B. Mays and Carl H. Casberg
University of Illinois

Here is a book presenting sound procedures in the field of school-shop administration, for the teacher in training or in active work. It emphasizes that the similarity of problems in the one-shop school, the large school, or a city-wide program offers opportunity to the young teacher for higher administrative work.

Price, $2.50

THE BRUCE PUBLISHING COMPANY
706 Montgomery Bldg.
Milwaukee, Wis.

NO RATIONING OF MEATY PROBLEMS!



GIVE your students a try at this actuating cylinder lock. Ask them to draw the correct orthographic views. See that they're all equipped with *Typhonite* ELDORADO pencils, and then watch for really good results.

In the *Typhonite* process, natural graphite is battered in a typhoon of super-heated steam until every particle is in controlled, uniform size. This results in leads that make lines of exceptional clarity, density, opaqueness.

SOLUTION: We will be glad to send you the free blueprint showing this problem's solution. Write, within 30 days, requesting Blueprint No. 128-J6.

FREE TO INSTRUCTORS: Object lines of this problem were drawn with a Typhonite ELDORADO 2H. We will send a sample to instructors if requested.

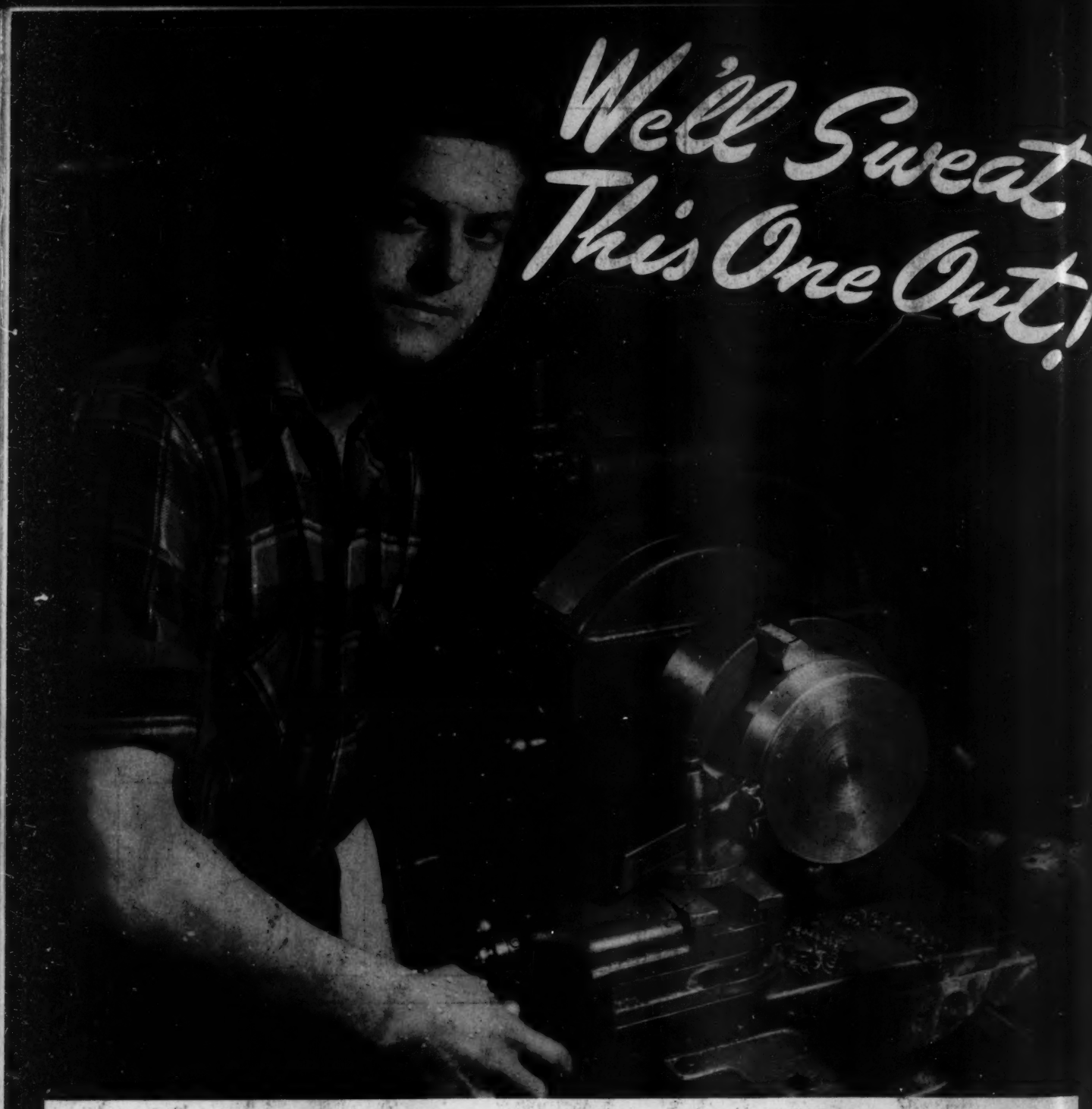
School Bureau
Joseph Dixon Crucible Company
Jersey City, N. J.

DIXON'S "BEST" *colored pencils with thick leads for major corrections or minor changes in design are recommended. Red (Vermilion) 349, Lake Red 321½, and Yellow 353 are the preferred colors for most effective contrast.*

DIXON'S "THINEX" *colored pencils with thin leads for small detail, dimensions and corrections are recommended. Vermilion 371, Lake Red 369, and Yellow 373 for effective contrast.*

TYPHONITE ELDORADO

We'll Sweat This One Out!



It's June — time the boys should be working with one eye on the window and teachers making a connection to sell books or be camp counselors.

But this is June, *1943*. This year, in thousands of vocational schools all over America, the only concession to summer will be the open windows.

But let's be honest. If the ingredients of this war are truly blood, sweat, and tears and we are called upon for only the sweat, nothing less than our best efforts can make us worthy of those who furnish the other two.

Full speed ahead. Humanity first, humidity second.

The R. K. LeBLOND MACHINE TOOL CO., CINCINNATI, OHIO
Largest Manufacturer of a Complete Line of Lathes

NEW YORK: 103 Lafayette St., Canal 6-5281

CHICAGO: 20 N. Wacker Dr., STA 5561

LeBLOND
USA